

#4

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re U.S. National Stage Appln. of)
Lutz Axel MAY et al.) Art Unit: Unassigned
Serial No.: 10/525,418) Examiner: Unassigned
Filing Date: February 23, 2005) Confirmation No.: 5069
I.A. No. PCT/EP03/09349) Attorney Docket No. 119508-00281
I.A. Filing Date: August 22, 2003)
Priority Date: August 23, 2002)
For: TORQUE SENSOR ADAPTER)

RECEIVED

2 MAR 2006

PETITION UNDER 37 C.F.R. § 1.47(b)

Legal Staff
International Division

Mail Stop Petition
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

11/03/2005 ATRAM1 00000067 10525418
02 FC:1464 130.00 OP

Sir:

The owner of the above-cited patent application, Abas, Inc., a wholly-owned subsidiary of Methode Electronics, Inc., (hereinafter "Rule 1.47(b) applicant") respectfully petitions under 37 C.F.R. § 1.47(b) to make application for patent on behalf of and as agent for one of the named joint inventors of the above-captioned patent application and to have the earliest filing date possible be assigned to the application.

A Petition under 37 C.F.R. § 1.47(b) must be accompanied by:

- (1) The fee under 37 C.F.R. § 1.17(i);
- (2) Factual proof that the inventor refuses to execute the application or cannot be reached after diligent effort;
- (3) A statement of the last known address of the inventor;
- (4) An oath or declaration executed by the Rule 1.47(b) applicant on behalf of and as agent for the non-signing inventor;

(5) Proof that the Rule 1.47(b) applicant has a sufficient proprietary interest in the application; and

03/07/2006 CSHOOT 00000001 232185 10525418
File Ref: 00000001 DA# 232185 10525418
01 FC:1463 70.00 DA 130.00 OP

(6) A showing that such action is necessary to preserve the rights of the parties or to prevent irreparable damage if the Petition is denied.

Each of the enumerated items above is discussed in detail below, with reference to supporting declarations submitted herewith by Stephen Harders and Alexander Straus and copies of documentary evidence.

1. The fee under 37 C.F.R. § 1.17(i)

The required petition and surcharge fees set forth in 37 C.F.R. §1.17(i) are enclosed with this Petition.

2. Factual proof that the inventor refuses to execute the application or cannot be reached after diligent effort

A *bona fide* attempt was made to present the application papers, including the specification, claims, and drawings, and amendments thereto, to both of the named joint inventors—Lutz Axel May and David Kelly. Documentary evidence supporting the attempt to obtain Lutz May's signature on the application papers and his refusal to sign are provided herewith.

As indicated on the enclosed Declaration of Stephen U. Harders, on August 22, 2003, Magna-Lastic Devices, Inc., a wholly owned subsidiary of Methode Electronics, Inc., procured certain intellectual property assets of Fast Technology AG, a company that had been incorporated in the Federal Republic of Germany. Those assets were purchased from Dr. Hans von Gleichenstein, a German court-appointed trustee and receiver of the assets owned by Fast Technology AG, after Fast Technology AG filed for bankruptcy under German law. Among the assets received by and in trust to Dr. von Gleichenstein was, *inter alia*, the above-cited international patent application as shown in Exhibit A of the Declaration. Dr. von Gleichenstein then transferred those purchased assets to Abas, Inc., another wholly owned subsidiary of Methode Electronics, Inc., at the behest of Methode Electronics, Inc.

As indicated in the enclosed Declaration of Dr. Alexander Straus, Lutz May was contacted on three occasions and requested to execute the Declaration for Patent and Power of Attorney form (i.e., "Inventors Declaration"): the first time on February 19, 2004, the second time on March 22, 2004, and the most recent time on August 24, 2005. See Decl. of

A. Straus at ¶¶ 6, 7, and 13. The application papers (i.e., the specification, claims, drawings, and amendments thereto) were presented to Lutz May for his review. See Decl. of A. Straus at ¶ 13. On each occasion, Lutz May refused, and continues to refuse, to execute any papers related to the above-captioned patent application, and/or has sought to delay responding to these requests. See Decl. of A. Straus at ¶¶ 8 and 14. Accordingly, based on the information provided in this Petition and the information in the Declaration of Dr. Straus submitted concurrently herewith, the Rule 1.47(b) applicant respectfully submits that factual proof exists that Lutz May refuses to execute the application.

3. A statement of the last known address of the inventor

One of the named joint inventors on the above-cited patent application is Lutz May, a German citizen. On information and belief, Lutz May's last known address is Wolfratshauser Strasse 23a, Gelting, 82538, Germany. That German address is listed on the published PCT application. The previous known address for Lutz May is believed to be 3 The Grange, Newbury, Berkshire RG14 6RJ, Great Britain. On information and belief, Lutz May may also be reached through his German attorney, Dr. Axel-Michael Wagner, of Peters, Schonberger & Partner, Schackstrasse 2, Munich, 80539, Germany. Lutz May is also listed on a web site as the Director of NCTEngineering GmbH, located at the address Erlenhof-Park, Inselkammerstr. 10, 82008 Unterhaching, Germany. See Decl. of S. Harders at ¶5.

4. An oath or declaration executed by the Rule 1.47(b) applicant on behalf of and as agent for the non-signing inventor

The Rule 1.47(b) applicant submits herewith a declaration executed on behalf of and as agent for the nonsigning inventor, Lutz May, in accordance with M.P.E.P 409.03(b), and which specifically states the citizenship of the inventor.

5. Proof that the Rule 1.47(b) applicant has a sufficient proprietary interest in the application

As stated in Steve Harder's Declaration, Lutz May was an employee of Fast Technology AG before it went bankrupt. See Decl. of S. Harder at ¶ 6. As stated in Dr. Straus' Declaration, Lutz May's actions as an employee of Fast Technology AG establish that Fast Technology AG was the owner of the above-captioned patent application and the

invention disclosed therein. See Decl. of A. Straus at ¶ 11. Those actions included consistently filing patent applications in the name of Fast Technology AG (i.e., not in Lutz May's name) and having Fast Technology AG pay for fees associated with prosecuting those patent application (i.e., not paying the fees himself).

Dr. Straus' Declaration includes an Annex I, which is a copy of the sales and transfer agreement signed by Dr. von Gleichenstein, on behalf of bankrupt Fast Technology AG, and a representative of Magna-lastic Devices, Inc. The agreement indicates the date of signatures and the intellectual property rights concerned as identified in the exhibits of the agreement. Among the patent applications purchased by Magna-lastic Devices, Inc., from Dr. von Gleichenstein is the international application PCT/EP03/09349, which formed the basis for filing of the above-cited patent application under 35 U.S.C. § 371. As described in the Declaration of Steven Harders, Dr. von Gleichenstein subsequently assigned the patent application to Abas, Inc. a sister company of MDI, at the instruction of Methode Electronics Inc., the parent company to both MDI and Abas, Inc.

Also submitted herewith is a copy of the complete assignment document, executed by Dr. von Gleichenstein on June 8, 2004, assigning all of the rights, title, and interest in international application PCT/EP03/09349, which formed the basis for filing of the above-cited patent application under 35 U.S.C. § 371, from Fast Technology AG to Abas, Inc.

Accordingly, based on the information provided in this Petition, the information in Dr. Straus' Declaration, and the executed assignment document from Fast Technology AG to Abas, Inc., submitted concurrently herewith, the Rule 1.47(b) applicant respectfully submits that factual proof exists that Abas, Inc., has a sufficient proprietary interest in the present application and there is a chain of title from Fast Technology AG to Abas, Inc.

6. A showing that such action is necessary to preserve the rights of the parties or to prevent irreparable damage if the Petition is denied

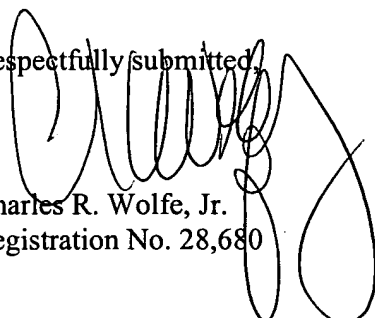
This Petition should be granted since Abas, Inc., has made diligent efforts to contact the co-inventor, pursuant to 37 C.F.R. §1.47(b), and has complied in good faith with the other requirements of that rule. Action by the PTO is necessary to preserve the rights of Abas, Inc., in the subject patent application.

7. Conclusion

In the event there are any questions relating to this Petition, the Declaration for Patent Application and Power of Attorney form, the Declaration of Stephen U. Harders, or to the application in general, it would be appreciated if the Patent Office would telephone the undersigned attorney concerning such questions so that the prosecution of this application may be expedited.

Any fee due is authorized above. Please charge any shortage or credit any overpayment of fees to BLANK ROME LLP, Deposit Account No. 23-2185 (119508-00281).

Respectfully submitted,


Charles R. Wolfe, Jr.
Registration No. 28,680

BLANK ROME LLP
600 New Hampshire Ave., N.W.
Washington, D.C. 20037
Telephone: (202) 772-5800
Customer No. 27557

Date: 10/28/05

REC'D OCT/PTO 28 OCT 2005 #4

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re U.S. National Stage Appln. of)	
Lutz Axel MAY et al.)	Art Unit: Unassigned
Serial No.: 10/525,418)	Examiner: Unassigned
Filing Date: February 23, 2005)	Confirmation No.: 5069
I.A. No. PCT/EP03/09349)	Attorney Docket No. 119508-00281
I.A. Filing Date: August 22, 2003)	
Priority Date: August 23, 2002)	
For: TORQUE SENSOR ADAPTER)	

DECLARATION OF STEPHEN U. HARDERS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the *Notice of Missing Requirements Under 35 U.S.C. § 371 In The United States Designated/Elected Office*, dated August 31, 2005, and in support of the accompanying *Petition Under Rule 1.47(b)*, the undersigned declares as follows:

1. I, Stephen U. Harders, am a citizen of the United States and am over 18 years old. I am the Assistant Secretary of Abas, Inc., which is a Delaware corporation having a principal place of business at 7401 W. Wilson Avenue, Chicago, Illinois 60706.

2. On information and belief, Fast Technology AG, which was a Germany company with a principal place of business at Gewerbegebiet Riemerling, Otto-Hahn-Strasse 24, 85521 Ottobrunn, Germany, filed for bankruptcy sometime in 2002 or 2003.

3. In accordance with German law, I understand that subsequent to Fast Technology AG declaring bankruptcy, Dr. Hans von Gleichenstein was appointed by a German court to be the receiver and trustee of the assets owned by Fast Technology AG. Among the assets received by and in trust to Dr. von Gleichenstein was, *inter alia*, the international application PCT/EP03/09349, which formed the basis for filing of the above-cited patent application under 35 U.S.C. § 371. Exhibit A contains a list of the Fast Technology AG assets received in trust by Dr. von Gleichenstein; that list shows international application PCT/EP03/09349 on page 3 of the "List B" table.

4. On August 22, 2003, Magna-Lastic Devices, Inc., a wholly owned subsidiary of Methode Electronics, Inc., entered into a contract with Dr. von Gleichenstein to purchase the intellectual property assets of Fast Technology AG. Dr. von Gleichenstein sold those purchased assets to Magna-Lastic Devices, Inc.

5. One of the named joint inventors on the above-cited patent application is Lutz Axel May, a German citizen. On information and belief, Mr. May's last known address is Wolfratshauser Strasse 23a, Geretsried, 82538, Germany. That German address is listed on the published PCT application. The previous known address for Mr. May is believed to be 3 The Grange, Newbury, Berkshire RG14 6RJ, Great Britain. On information and belief, Mr. May may also be reached through his German attorney, Dr. Axel-Michael Wagner, of Peters, Schonberger & Partner, Schackstrasse 2, Munich, 80539, Germany. Mr. May is also listed on a web site as the Director of NCTEngineering GmbH, located at the address Erlenhof-Park, Inselkammerstr. 10, 82008 Unterhaching, Germany.

6. On information and belief, Mr. May had been an employee of Fast Technology AG when it entered the aforementioned German bankruptcy proceeding, and, as such, had regularly assigned inventor's oaths and assignment documents for patent applications for his inventions to Fast Technologies AG.

7. In the course of prosecuting the above-cited patent application, Abas, Inc., attempted, both through Dr. von Gleichenstein and through its private Germany attorneys, to

obtain Mr. May's signature on an assignment document and a Declaration for Patent and Power of Attorney form. Upon advice of his own counsel, Mr. May has refused and continues to refuse to execute those documents, despite having previously assigned many other patents and patent applications to Fast Technology AG (the refusal was given orally to Abas, Inc.'s German counsel). On information and belief, Mr. May pursued all of his patents through his patent attorneys and consistently named Fast Technology AG as the assignee. Upon inspection of other Lutz May patent applications owned by Abas, Inc., Mr. May appears to have rendered his signature freely on the Declaration for Patent and Power of Attorney forms and assignment documents in favor of Fast Technology AG whenever it became necessary to submit those documents in the course of prosecution of those other patent applications. I am not aware of any legal grounds for Mr. May refusing to sign the Declaration for Patent and assignment document in this case, as he has done in the other cases.

8. On information and belief, a complete copy of the above-cited application, including the specification, claims, drawings, and any amendments, was sent to the joint inventors, Mr. May and David Kelly, for their review along with the Declaration for Patent and Power of Attorney form and assignment document.

9. Magna-Lastic Devices, Inc., purchased the Fast Technology AG assets from Dr. von Gleichenstein in good faith believing that Dr. von Gleichenstein had received ownership of the assets and that Mr. May and Mr. Kelly had properly assigned their rights, title, and interests in and to the patents and patent applications to Fast Technology AG. Subsequently, Dr. von Gleichenstein assigned the rights to Abas, Inc., a wholly owned subsidiary of Methode Electronics, Inc., at the behest of Methode Electronics, Inc.

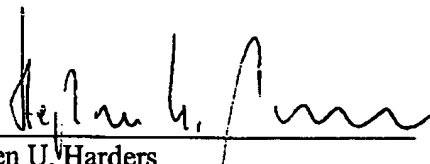
10. Abas, Inc., through its local German counsel, has taken steps to obtain Mr. May's signature on the Declaration for Patent and Power of Attorney form for the present application, including filing a suit against Mr. May in German court. Abas, Inc., has obtained an opinion of its local German counsel that there is a strong likelihood that a court of competent jurisdiction will, by weight of the authority, order Mr. May to execute the required documents, including execution of an assignment document to clarify ownership of the above-cited patent application,

the assignment document conveying all his rights, title, and interests to Abas, Inc., or to Dr. von Gleichenstein, who had transferred ownership of the above-cited international patent application to Abas, Inc.

11. David Kelly, the other joint inventor, who was affiliated with Fast Technology AG at the time of the invention set forth in the above-cited patent application, has executed the application papers and assigned his rights, title, and interest in and to the invention and patent application to Abas, Inc.

12. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001, and that such willful false statements may jeopardize the validity of the application of any patent issued thereon.

Respectfully submitted,



Stephen U. Harders

Address: Abas, Inc.
7401 W. Wilson Avenue
Chicago, IL 60706

Date:

Oct 27, 2005

EXHIBIT A

ASSIGNMENT

WHEREAS, **FAST Technology AG**, a Germany company, having a principal place of business at Gewerbegebiet Riemerling, Otto-Hahn-Strasse 24, 85521 Ottobrunn, Germany, hereinafter referred to as **ASSIGNOR**, is the owner by assignment of the U.S. and foreign patent properties identified in Appendix A hereto (hereinafter referred to as the **PATENT PROPERTIES**).

WHEREAS, **Abas, Incorporated**, a Delaware corporation, having a principal place of business at 7401 W. Wilson Avenue, Chicago, Illinois 60706, hereinafter referred to as **ASSIGNEE**, is desirous of acquiring the entire right, title and interest in and to the same in the United States and around the world;

NOW, THEREFORE, for good and valuable consideration, receipt of which is hereby acknowledged, **ASSIGNOR**, by these presents does sell, assign and transfer unto said **ASSIGNEE**, the entire right, title, and interest in and to said **PATENT PROPERTIES** identified in the attached ~~Appendix A~~ ^{LIST "B"} throughout the United States of America and the world, including any and all United States Letters Patent granted on any division, continuation, continuation-in-part and reissue of said **PATENT PROPERTIES**; including the right to sue for past infringement; the right to apply for patents and inventor certificates in respect thereof and to claim priority pursuant to rights accorded **ASSIGNOR** under the terms of the Paris International Convention and all other available international conventions and treaties; and the entire right, title and interest in and to any and all patents, patents of addition, utility models, patents of importation, revalidation patents and inventor certificates which may be granted throughout the world in respect of said **PATENT PROPERTIES**.

ALSO, **ASSIGNOR** hereby agrees to execute any documents that legally may be required in connection with the filing, prosecution and maintenance of said application or any other patent application(s) or inventor certificate(s) in the United States and in foreign countries for said **PATENT PROPERTIES**, including additional documents that may be reasonably required to affirm the rights of **ASSIGNEE** in and to said **PATENT PROPERTIES**, all without further consideration. **ASSIGNOR** also agrees, without further consideration and at **ASSIGNEE**'s expense, to identify and communicate to **ASSIGNEE** at **ASSIGNEE**'s reasonable request documents and information concerning the **PATENT PROPERTIES** that are within **ASSIGNOR**'s possession or control, and to

provide further assurances and testimony on behalf of ASSIGNEE that lawfully may be required of ASSIGNOR in respect of the prosecution, maintenance and defense of any patent application or patent encompassed within the terms of this instrument. ASSIGNOR's obligations under this instrument shall extend to ASSIGNOR's heirs, executors, administrators and other legal representatives.

ASSIGNOR hereby authorizes and requests the Commissioner for Patents to issue any and all United States Letters Patent referred to above to ASSIGNEE, as the ASSIGNEE of the entire right, title and interest in and to the same, for ASSIGNEE's sole use and behalf; and for the use and behalf of ASSIGNEE's legal representatives and successors, to the full end of the term for which such Letters Patent may be granted, as fully and entirely as the same would have been held by ASSIGNOR had this assignment and sale not been made.

ASSIGNOR authorizes any member of the firm of **Blank Rome LLP** to insert or complete any information in this document needed to effect its recordal in the U.S. Patent & Trademark Office.

FAST Technology AG

[Signature] GLEICHENSTEIN & BREITLING

Rechtsanwälte
Rönnertstraße 34, 1. o.

80333 München

Dr. Hans v. Gleichenstein

Telefon 0 89/54 27 30-0

Telefax 0 89/54 27 30-15

roe@gleichenstein-und-koll.de

Authorized Agent

08.06.04
[Date]

LIST „B“

Kind of IPR	Application no./Registration no.	Country
Regional phase of PCT/GB99/00736	99907770.4	EP
Patent	6,581,480	US
Patent	2000-546211	JP
Regional phase of PCT/GB00/01103	00912776.2	EP
Patent	145533	IL
Patent	2000-606976	JP
Patent	09/937,230	US
National phase of EP 1203209	Not yet known 60007641-CO	DE
National phase of EP 1203209	1203209	GB
Patent	148017	IL
Patent	2001-517133	JP
Patent	10/049,323	US
National phase of EP 1203210	60007641.5	DE
National phase of EP 1203210	1203210	GB
Patent	148016	IL
Patent	2001-517134	JP
Patent	10/049,322	US
Regional phase of PCT/EP00/09783	0971326.4	EP
Patent	148957	IL
Patent	2001-530597	JP
Patent	10/110,007	US
National phase of EP 1221030	60007540.0	DE
National phase of EP 1221030	1221030	GB
Patent	148954	IL
Patent	2001-530548	JP
Patent	10/089,978	US
Regional phase of PCT/EP01/03562	01931551.4	EP
Patent	151755	IL
Patent	2001-571064	JP
Patent	10/239,545	US
Regional phase of PCT/EP01/04077	01931581.1	EP
Patent	152176	IL
Patent	2001-576421	JP
Patent	10/257,337	US
Regional phase of PCT/EP01/05705	01943403.4	EP
Patent	152142	IL
Patent	2001-586430	JP
Patent	10/258,275	US

Regional phase of PCT/EP01/06482	01960281.2	EP
Patent	153088	IL
Patent	2002-510906	JP
Patent	Not yet known	US
Regional phase of PCT/EP01/10438	01982269.1	EP
Patent	154855	IL
Patent	2002-527746	JP
Patent	10/363,886	US
Regional phase of PCT/EP02/00786	02718049.6	EP
Regional phase of PCT/EP02/00784	02718048.8	EP
Regional phase of PCT/EP01/13698	01985823.2	EP
Regional phase of PCT/EP02/01225	02722048.2	EP
Regional phase of PCT/EP02/01704	02719862.1	EP
Regional phase of PCT/EP02/01230	02710844.8	EP
Regional phase of PCT/EP02/08820	02764837.7	EP
National phase of PCT/EP02/08820	2003-519437	JP
National phase of PCT/EP02/08820	Not yet known	US
Regional phase of PCT/EP02/04871	02730232.2	EP
National phase of PCT/EP02/04871	2002-588103	JP
National phase of PCT/EP02/04871	Not yet known	US
Regional phase of PCT/EP02/06300	02778885.0	EP
National phase of PCT/EP02/06300	2003-504060	JP
National phase of PCT/EP02/06300	Not yet known	US
Regional phase of PCT/EP02/13952	02791795.4	EP
National phase of PCT/EP02/13952	2003-551498	JP
National phase of PCT/EP02/13952	Not yet known	US
Regional phase of PCT/EP02/06960	02745405.7	EP
National phase of PCT/EP02/06960	2,450,137	CA
National phase of PCT/EP02/06960	2003-506690	JP
National phase of PCT/EP02/06960	Not yet known	US
International Patent Application	PCT/EP03/01908	WO
Patent	10/373,636	US

U.S. 10/297,980

U.S. 10/477,180

U.S. 10/480,597

U.S. 10/498,058

U.S. 10/482,002

International Application	Patent	PCT/EP03/01907	WO
Patent		10/373,634	US
International Application	Patent	PCT/EP03/04355	WO
Patent		10/419,995	US
International Application	Patent	PCT/EP03/09349	WO
International Application	Patent	PCT/EP03/10634	WO
Patent		02028056.6	EP
International Application	Patent	PCT/EP03/12104	WO
International Application	Patent	PCT/EP2004/00044	WO

Attorney Docket: 119508-00281

DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY

The undersigned 37 CFR § 1.47(b) applicant, a representative of the owner of the instant application, ABAS, Inc., acting on behalf of and as agent for the nonsigning inventor, Lutz Axel May, hereby declares that:

I believe that Lutz Axel May, a citizen of Germany, is an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled **TORQUE SENSOR ADAPTOR**, the specification of which

☐ is attached hereto

☒ was filed on **August 22, 2003** as United States Application Number or PCT International

Application Number **PCT/EP2003/009349** and (if applicable) was amended on

I hereby authorize our attorneys to insert the serial number assigned to this application.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 USC §119

APPLICATION NO.	COUNTRY	DAY/MONTH/YEAR FILED	PRIORITY CLAIMED
0219745.7	GB	23.08.2002	Yes

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

PROVISIONAL APPLICATION(S) UNDER 35 U.S.C. §119(e)

APPLICATION NUMBER	FILING DATE

I hereby claim the benefit under 35 U.S.C. §120 of any United States application, or §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. §112.

PRIOR U.S./PCT INTERNATIONAL APPLICATION(S) DESIGNATED FOR BENEFIT UNDER 35 U.S.C. §120

APPLICATION NO.	FILING DATE	STATUS — PATENTED, PENDING, ABANDONED

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith: Victor M. Wigman, Reg. No. 25,201; George C. Myers, Jr., Reg. No. 27,040; Michael C. Greenbaum, Reg. No. 28,419; Charles R. Wolfe, Jr., Reg. No. 28,680; Michael D. White, Reg. No. 32,795; David J. Edmondson, Reg. No. 35,126; Evan R. Smith, Reg. No. 35,683; Brian C. Jones, Reg. No. 37,857; Peter Weissman, Reg. No. 40,220; Denise C. Lane, Reg. No. 42,780; Tara L. Hoffman, Reg. No. 46,510; Brian Wm. Higgins, Reg. No. 48,443; Minh-Quan K. Pham, Reg. No. 50,594.

Correspondence Address:**BLANK ROME LLP**

600 New Hampshire Avenue, N.W.

Washington, DC 20037

TEL (202) 944-3000 FAX (202) 572-8398

**27557**

PATENT TRADEMARK OFFICE

Attorney Docket: 119508-00281

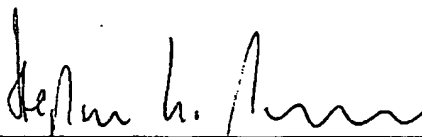
I, the undersigned, certify that I am an individual empowered to act on behalf of Abas, Inc.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Oct 26, 2005

Date Signed

Abas, Inc.



By: Stephen U. Harders

Its: Assistant Secretary

DECLARATION OF DR. ALEXANDER STRAUS

1. I, Alexander Straus, Ph.D., a citizen of Germany, am a Partner in the national Patent Law firm of Becker · Kurig · Straus, which is a partnership according to the German Civil Code. I reside in the firm's Munich office where I am the head of the Biotech Department. As a German and European Patent Attorney, I am licensed to practice patent law in Germany and before the European Patent Office as well as before the Community Trademark Office in Alicante (Spain). I have over 13 years of experience in the field of intellectual property rights and am familiar with the United States Patent & Trademark Office's (USPTO) rules of practice and procedure, patent regulations, and patent laws.
2. I have been asked to provide this declaration on behalf of Magna-lastic Devices, Inc., and Abas Inc., which I understand will be filed in the USPTO in connection with one or more patent applications owned by Abas, Inc.
3. Magna-Lastic Devices purchased the intellectual property rights of a German company, FAST Technology AG, which had become bankrupt and was put under receivership in accordance with German law. Dr. Hans von Gleichenstein, from the Law Office Gleichenstein & Breitling, Rottmannstrasse 11A, 80333 München, had been appointed liquidator.
4. In collecting money for the debtors of FAST Technology AG, Dr. von Gleichenstein offered all assets, material and immaterial, for sale. Magna-lastic Devices, Inc., made a bid for the intellectual property rights of FAST Technology AG, including patents, patent applications and trademarks. That bid was eventually accepted by Dr. von Gleichenstein in August 2003. Annex I is a copy of the sales and transfer agreement signed by Dr. von Gleichenstein and a representative of Magna-lastic Devices, Inc., indicating the date of signature and the intellectual property rights concerned as identified in the exhibits of the agreement. Among the patents/patent applications purchased by Magna-lastic Devices, Inc., from Dr. von Gleichenstein are the following properties identified by attorney docket numbers and International Application publication numbers:

DECLARATION OF DR. ALEXANDER STRAUS

European Attorney Docket No.	International Application No.	U.S. Attorney Docket No.	U.S. Application Serial No.
51929US	PCT/EP03/09349	119508-00281	10/525,418
52016US	PCT/EP03/10634	119508-00282	10/529,326
52024US	PCT/EP02/08820	119508-00255	10/485,960
52025US	PCT/EP02/04871	119508-00103	10/477,180
52027US	PCT/EP02/06300	119508-00104	10/480,597
52059US	PCT/EP04/00044	119508-00297	10/546,169

5. As the European Patent Attorneys acting for Magna-lastic Devices, my firm assumed responsibility for the patents/patent applications purchased by Magna-Lastic Devices, Inc., including, inter alia, effecting a transfer of rights to Abas, Inc., and prosecuting the International Applications at the national/regional level by entering the European regional phase and the national stage at the USPTO. For doing the latter, we instructed Charles R. Wolfe, Jr., a Partner in the national law firm of Blank Rome, Washington, D.C., to take care of the U.S. national stage of the International patent applications. I understand that the serial numbers and docket numbers assigned to the U.S. applications are:

6. Mr. Wolfe sent us unexecuted Inventors Declarations and assignment documents for all of the U.S. patent applications, among those the aforementioned ones. We contacted the inventor, Mr. Lutz May, on February 19, 2004, to obtain his signature on documents to be signed. Even though in the past Lutz May had signed Inventors Declarations and assignment documents in several other cases, he refused to do so, including the two matters identified above.

7. I contacted Dr. von Gleichenstein on March 17, 2004, and requested that he take the necessary steps to acquire Lutz May's signatures. In a letter dated March 22, 2004, Dr. von Gleichenstein sent Lutz May a formal warning indicating that his refusal to sign might bring him near criminal acts, while setting a time limit for signing the papers to avoid litigation. A copy of the March 22, 2004, letter is attached as Annex II.

DECLARATION OF DR. ALEXANDER STRAUS

8. Lutz May responded, through his attorney, in a letter dated April 5, 2004 (a copy of which is attached as Annex III). In the letter, Lutz May essentially claims that he does not need to sign any papers, since during the time FAST Technology AG existed and filed patent applications derived from Lutz May, the formal provision of the German Inventors Employee Law had never been correctly observed, so that in consequence the inventions had never been transferred to FAST Technology AG.

9. In order to be able perfect title to the patent applications Magna-lastic Devices purchased from Dr. von Gleichenstein and transferred to Abas, Inc., Mr. Lutz May has been sued at the Civil Court in Munich, Germany, to compel his signature on the assignments.

10. The arguments with which Lutz May defends his position in this proceedings are two-fold. First, he contends that the patent applications did not belong to FAST Technology AG and, consequently, could not be sold by Dr. von Gleichenstein to Magna-lastic Devices, Inc. Second, if the inventions were adjudicated as belonging to FAST Technology AG, the liquidator still could not have sold them, since the formal requirements of the German Employee Invention law in a bankruptcy situation had not been properly observed and Lutz May had not been properly remunerated.

11. It is Abas, Inc.'s position that Lutz May was both the inventor named in the applications and a member of the Management Board of FAST Technology AG, who was responsible for taking care of all the issues relating to inventions, namely communicating with external patent attorneys, filing applications in the name of FAST Technology AG, prosecuting the applications in the name of FAST Technology AG, and releasing payment of attorneys fees from FAST Technology AG. During his time as a FAST employee, he always performed as if the inventions belonged to FAST Technology AG, as evident, e.g., from the Powers of Attorney for the International applications in the present two files, which establishes that he signed on the one hand for the applicant (i.e., FAST Technology AG) in all states except the United States, while in the United States he himself signed. Also, he had all of the invoices paid by FAST Technology AG, and not by himself.

DECLARATION OF DR. ALEXANDER STRAUS

12. The lawsuit against Lutz May was filed on January 4, 2005, and is still pending. Lutz May's response to the lawsuit was received on February 21, 2005. The first oral hearing took place on June 9, 2005.

13. We contacted the inventor, Lutz May, through his attorney, on August 24, 2005, and again requested that Lutz May execute the aforementioned Inventors Declarations and assignment documents that Mr. Wolfe had sent us. We also provided Lutz May with copies of all of the relevant application papers (i.e., the specification, drawings, and claims, and any amendments made thereto) for his review. Annex IV is a copy of the courier receipt acknowledging receipt of the papers by Lutz May's attorneys. Annex V contains a copy of the papers that we provided to Lutz May, through his attorney, for the two U.S. applications listed above.

14. Lutz May responded, through his attorney, in a letter dated August 30, 2005 (a copy of which is attached as Annex VI). In the letter, Lutz May's attorney contends that not all of the file wrapper papers were provided. While this is in fact true, we did provide to him the relevant application papers, as noted above and shown in Annex V. Also in the letter, Lutz May's attorney contends that he would need to have a U.S. attorney review the papers in depth before responding further. The U.S. application is the same as the corresponding PCT application (both of which are in English so there is no translation problems), and the Preliminary Amendments only changed the multi-dependent claims to be singularly dependent and corrected grammatical errors. Thus, an in-depth analysis is not required in order to execute the Inventors Declarations.

15. Based on the above facts, factual proof exists that Lutz May refuses to execute the application or cannot be reached after diligent efforts. A *boni fide* attempt was made to present the application papers, including the specification, claims, and drawings, to Lutz May, as evident in the delivery receipts attached hereto. Lutz May's refusal to execute the papers is evident in the letters attached hereto. The transfer of ownership of the patents/patent applications purchased by Magna-Lastic Devices, Inc., is evident in the sales and transfer agreement attached hereto.

16. The following Annexes are included as part of this Declaration:

- a. Annex I: Sales and Transfer Agreement;
- b. Annex II: March 22, 2004, letter from Dr. von Gleichenstein to Lutz May;

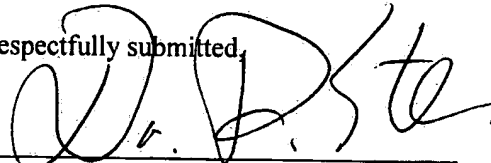
DECLARATION OF DR. ALEXANDER STRAUS

- c. Annex III: April 5, 2004, letter from Lutz May's attorney to Dr. Straus;
- d. Annex IV: Delivery receipts;
- e. Annex V: Copy of application papers sent to Lutz May; and
- f. Annex VI: August 30, 2005, letter from Lutz May's attorney to Dr. Straus.

17. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like may be punishable by fine or imprisonment, or both, under German and United States law.

October 20, 2005
Date:

Respectfully submitted,


By: Dr. Alexander Straus.
Becker Kurig Straus
Bavariastr. 7
80336 Munich, Germany

ANNEX I

ENVIKKA +

DR. HANS VON GLEICHENSTEIN
IN HIS CAPACITY AS INSOLVENCY ADMINISTRATOR
OF THE ESTATE OF FAST TECHNOLOGIES AG

AND

MAGNA-LASTIC DEVICES, INC.

SALE AND TRANSFER AGREEMENT
FOR INTELLECTUAL PROPERTY RIGHTS
OF FAST TECHNOLOGIES AG

Contents

Clause	Page
1. Sale and Transfer	3
2. Purchase Price	5
3. Employee Invention (<i>Arbeitnehmererfindung</i>) and Purchase Price Adjustment	6
4. Representations and Warranties	6
5. Future Business - Licenses	7
6. Costs	7
7. Final Provisions	7
EXHIBIT 1.1 IP Rights	9
EXHIBIT 1.6 Form der / Form of <i>Übertragungserklärung/Declaration of Assignment</i>	10

SALE and TRANSFER AGREEMENT

between

Dr. Hans von Gleichenstein in his capacity as insolvency administrator of the estate of FAST Technology AG, Otto-Hahn-Strasse 24, Gewerbegebiet Riemerling, 85521 Ottobrunn, Germany

"Seller"

and

Magna-lastic Devices, Inc., 111 W. Buchanan Street, Carthage, IL 62321, United States of America

"Purchaser"

The Seller is insolvency administrator over the estate of FAST Technology AG ("FAST AG"), a stock corporation with its seat in Munich, Germany which was engaged, in particular, in the development and manufacture of non-contact sensors used to measure torque.

FAST AG has two subsidiaries, Fast Technology Limited with its seat in Newbury Berks, United Kingdom and FAST Technology L.L.C. with its seat in Livonia, Michigan (together the "FAST Subsidiaries").

The Purchaser, a subsidiary of Methode Electronics Inc., is also engaged in the field of torque sensing and control technology and is interested in gaining an undisputed prevailing ownership in the intellectual property rights which are relevant for its business.

Now, therefore, the Seller wishes to sell and the Purchaser wishes to purchase all IP Rights as defined below.

1. SALE AND TRANSFER

- 1.1 The Seller hereby sells and transfers to the Purchaser with effect as of 31 August 2003 (the "Effective Date") all patents, utility models, registered designs, trade marks, logos and know-how (in particular specific knowledge which has not yet been made available to the public) as well as similar intellectual property rights, whether registered or not, of FAST AG, together with all rights from applications for registration of such rights (together the "IP Rights"). In particular but without limitation thereto, the Seller sells and transfers to the Purchaser the IP Rights listed in Exhibit 1.1 whereby the sale and transfer of each of the IP

Rights under Nos. 21, 32 and 34 of the list titled "Summary of Cases" in Exhibit 1.1 (the "IP List") is subject to the dissolving condition (*auflösenden Bedingung*) that the respective Employee Inventor as defined in Clause 3.2 exercises his statutory pre-emption right (as set out in Clause 3 below). The Purchaser accepts this sale and transfer. To the extent that the transfer of legal title cannot be effected by the Effective Date, as between the parties, they shall put each other in a position they would have been in if the transfer had been effected by the Effective Date.

- 1.2 The IP Rights sold and transferred also include all inventions, business secrets, procedures, formulae and all technical know-how, exclusive and non-exclusive rights to use copy rights (*Nutzungsrechte*) including the right to use software developed in-house (for example by employees) (but excluding software licences from third parties), regardless of whether they are legally protected or not, including all their embodiments, such as for example drawings, records, including data available on files, other computer-readable media or other documentation relating to the IP Rights of FAST AG (all embodiments together the "IP Documentation").
- 1.3 In relation to the IP Rights sold and transferred under this Agreement, in particular those listed under Nos. 1, 2, 13, 30, 31 and 32 of the IP List, which are currently not yet owned by and/or not yet registered in the name of FAST AG, but for the transfer of which FAST AG has a legally valid claim against the respective inventors or any other third party (pursuant to contracts or otherwise), the Seller hereby sells and transfers these claims to the Purchaser. To the extent a sale and transfer of such claims is not legally possible, the Seller shall use all reasonable efforts to effect the legally valid registration of such rights for the Purchaser.
- 1.4 In relation to the IP Rights owned by FAST Subsidiaries, if any, the Seller will use its best efforts to procure that the FAST Subsidiaries transfer the relevant IP Rights to the Purchaser on or before 31 October 2003.
- 1.5 For the avoidance of doubt, the Parties agree that the sale and transfer of the IP Rights under this Agreement does not include the sale and transfer of any tangible assets (e.g. machines and equipment, technical facilities, trade and business fixtures, inventory) nor, with the exception of the IP Rights as defined and specified in Clauses 1.1 to 1.4 hereof, does it include the sale of any intangible assets; in particular, it does not include the sale and transfer of any customer relations or of contractual relationships of any kind such as supply, agency or lease agreements. Furthermore, the Parties agree that the sale and transfer of the IP Rights does not include the transfer of any employment relationship existing between FAST AG and any of its employees.
- 1.6 The Seller is obliged to give all declarations and perform all acts necessary to effect the change of registration of the IP Rights in the relevant registers to the Purchaser. A draft form

of such a consent declaration to the change of registration of the IP Rights is attached as Exhibit 1.6. The Purchaser shall submit to the Seller suitable assignment forms for each of the relevant registered IP Rights. The Seller shall present to the Purchaser the duly signed forms legalised by a public notary (with apostille affixed to the extent required by law) within 10 business days after receipt of the draft forms from the Purchaser.

- 1.7 As soon as possible following signature of this Agreement, the Seller shall submit to the Purchaser the IP Documentation. Furthermore, the Seller shall assist the Purchaser as much as reasonable possible, until the full transfer of title to the IP Rights will have been effected, to safeguard the protection of the IP Rights. In particular, the Seller will undertake all necessary steps to procure that all relevant applications for the prolongation of any IP Rights are made in due time.

2. PURCHASE PRICE

- 2.1 The purchase price amounts to EUR , subject to a purchase price reduction pursuant to Clause 3.3 (the "Purchase Price").
- 2.2 A partial purchase price of EUR (subject to Clauses 3.3 and 3.4 below) (the "First Partial Purchase Price") is due for payment to the Seller on the Effective Date.
- 2.3 A partial purchase price of EUR (subject to Clauses 3.3 and 3.4 below) (the "Second Partial Purchase Price") shall be due for payment to the Seller 10 business days after the last of the IP Rights listed in Exhibit 1.1, including in particular the IP Rights listed under Nos. 1, 2, 13, 30, 31 and 32 of the IP List have been legally valid registered in the name of the Purchaser, at the latest, however, on 1 September 2005.
- 2.4 Payments to the Seller shall be made to the following Seller's account:

Account Holder: Hans von Gleichenstein

Account No.: 7513104

Bank: Deutsche Bank

Sorting code: 700 700 24

Reference: "*Kaufpreis für IP-Rechte an Herrn von Gleichenstein in seiner Eigenschaft als Insolvenzverwalter der Fast Technologies AG*"

3. **EMPLOYEE INVENTION (*ARBEITNEHMERERFINDUNG*) AND PURCHASE PRICE ADJUSTMENT**

- 3.1 The Seller undertakes to procure that all employees who have made service inventions (*Dienstleistungen*) as defined in Section 4 Employee Inventors' Act (*Arbeitnehmererfindungsgesetz*) ("AFG") during the term of their employment with FAST AG, unless they have already done so, will duly notify the Seller of such inventions pursuant to Section 5 AFG prior to the Effective Date and the Seller will fully claim the rights under the inventions pursuant to Section 6 ss AFG. The Seller undertakes to use all reasonable efforts in order to procure that the legal assignment and registration of these rights for FAST AG and, ultimately, the Purchaser, is achieved without undue delay after signature of this Agreement.
- 3.2 The Purchaser is aware that the sold IP Right(s) listed under Nos. 21, 32 and 34 of the IP List are based on employees service inventions (*Dienstleistungen*) and are therefore subject to a statutory pre-emption right for the benefit of the respective employee inventor (the "Employee Inventors") pursuant to Section 27 para. 2 AFG to the effect that Georg Cuntze has a pre-emption right (*Vorkaufsrecht*) in respect of the IP Rights listed under Nos. 21 and 32 of the IP List and David Kelly has a pre-emption right in respect of the IP Right listed under No. 34 of the IP List. The Seller undertakes to send a copy of this agreement to the Employee Inventors without undue delay after signature of this Agreement.
- 3.3 The Seller shall notify the Purchaser as soon as he has received notice from an Employee Inventor that he exercises his statutory pre-emption right. If such right is exercised, the Purchase Price is reduced by the purchase price payable by the Employee Inventor pursuant to Section 467 of the German Civil Code (the "Purchase Price Reduction Amount").
- 3.4 The Purchase Price Reduction Amount shall reduce the Second Partial Purchase Price. If the First Partial Purchase Price has already been paid to the Seller by the time the Purchase Price Reduction Amount becomes due, repayments thereof only become due if and to the extent the Purchase Price Reduction Amount exceeds the amount of the Second Partial Purchase Price.

4. **REPRESENTATIONS AND WARRANTIES**

- 4.1 The Purchaser has inspected the IP files available for FAST AG and compiled the information included in Exhibit 1.1. The Purchaser therefore has detailed knowledge about the IP Rights to be sold and their current legal status. The Seller does not give any representation or warranty in respect of the IP Rights, the IP Documentation or otherwise in respect of legal circumstances or effects described in this Agreement. In particular, the

Seller does not assume any liability for the existence of and ownership to the IP Rights listed in Exhibit 1.1.

- 4.2 Furthermore, all statutory warranty claims or other statutory or contractual claims for damages of the Purchaser out of or in connection with this Agreement, except for any claims which are based on gross negligence or wilful acts of the Seller, are excluded.

5. FUTURE BUSINESS - LICENSES

- 5.1 The Parties agree that, also after the sale and transfer of the IP Rights under this Agreement has become effective, the Seller may freely sell and transfer assets of FAST AG (other than the IP Rights and the IP Documentation sold and transferred to the Purchaser under this Agreement) to any third party, whether by selling and transferring individual assets or by transferring the whole business of FAST AG and that any such sale and transfer, even if this includes inventory which has been produced under exploitation of the IP Rights sold hereunder, shall in no event be construed as an infringement of the IP Rights.

- 5.2 Following the transfer of the IP Rights to the Purchaser as set out in this Agreement, in line with its business policy, the Purchaser will continue offering licenses for the use of its intellectual property rights including the IP Rights acquired hereunder under its standard terms and conditions. On that basis, the Purchaser is willing to enter into negotiations in view of a potential license of the IP Rights subject to such standard terms and conditions to qualifying former customers of FAST AG (in particular with Chicago Pneumatic Tool Company).

6. COSTS

All costs arising in connection with this Agreement, in particular all costs arising from the transfer of the IP Right to the Purchaser and the respective change of registration shall be borne by the Purchaser. For the avoidance of doubt, the Seller shall not bear any costs for the estate of FAST AG in connection with the fulfilment of his obligations pursuant to this Agreement, in particular in connection with his obligations pursuant to Clauses 1.6 and 1.7 hereof.

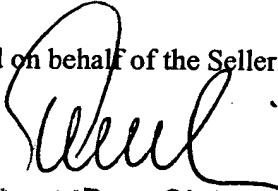
7. FINAL PROVISIONS

- 7.1 This Agreement contains all agreements reached between the Parties. There are no side agreements.
- 7.2 Any amendments or supplements to this Agreement as well as the waiver of any rights under this Agreement shall be in writing to be effective unless notarisation is required. This also applies to any amendment to, or cancellation of, this written form clause.

- 7.3 This Agreement is governed by German law. The place of exclusive jurisdiction for all disputes between the Parties arising out of or in connection with this Agreement or regarding its validity is Munich.
- 7.4 Should a provision of this Agreement or a provision included in this Agreement at a later point in time be or become invalid or null and void as a whole or in part, or should a gap in this Agreement become evident, this does not affect the validity of the remaining provisions. The invalid or null and void provision is replaced, or the gap is filled in, respectively, with effect *ex tunc* by such valid regulation which in legal and economic terms comes closest to what the Parties intended or would have intended in accordance with the purpose of this Agreement if they had considered the point at the time of conclusion of this Agreement.

München, 22.8.03/26.8.03 Chicago, IL 8-22-2003
Place / Date Place / Date

For and on behalf of the Seller:


Name: Dr. v. Gleichenstein
Function: as Insolvency Administrator

GLEICHENSTEIN & BREITLING
Rechtsanwälte
Rottmannstraße 11 a
80333 München
Telefon 0 89/54 27 30-0
Telefax 0 89/54 27 30-15
rae@gleichenstein-und-koll.de

For and on behalf of the Purchaser:

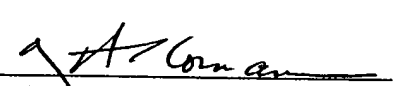

Name: DOUGLAS A. KOMAN
Function: VICE PRESIDENT CORPORATE FINANCE

EXHIBIT 1.1
IP RIGHTS

SUMMARY OF CASES① TSIC, IC Patent, Electronics Patent, Torque Sensor IF (FT Case Ref.1)

US Patent No: 6,348,812
Assignees: Fast Technology GmbH & Fast Technology AG
Inventors: Lutz May, Adrian Paul Brokaw
Assignment from Adrian Paul Brokaw to Fast Technology GmbH recorded at USPTO on 16 February 2001;
Assignment from Lutz May to Fast Technology AG recorded at USPTO on 5 December 2001.

Japanese Patent Application No: 10-548920
Applicant: Lutz Axel May

European Patent No: 0981760
Patentee: Fast Technology AG
Validated in: Italy, Spain, Germany, Sweden, France and the United Kingdom
Assignment from original applicant Lutz May to Fast Technology AG recorded at EPO on 19 November 2001.

② Torque/Force Base Patent (FT Case Ref.2)

US Patent Application No: 09/873930 *US 6581480*
Inventors/Applicants: Lutz May, Neil Brodey, John Owsley
Assignment from Lutz May to Fast Technology AG dated 12 February 2003, assignment from Neil Brodey to Fast Technology AG dated 21 March 2003; **STILL AWAITING ASSIGNMENT FROM JOHN OWSLEY** - Not received by Lloyd Wise as of 7 August 2003 despite numerous reminders both by telephone and facsimile/mail - No assignments yet recorded at USPTO.

Japanese Patent Application No: 2000-546211
Applicant: Fast Technology GmbH

European Patent Application No: 99907770.4
Applicant: Fast Technology AG

3. Automatic Gain Control (FT Case Ref. 3)

US Patent Application No: 09/937,230
Assignee: Fast Technology GmbH
Inventors: Lutz May, John Owsley
Assignment recorded at USPTO on 2 January 2003.

Japanese Patent Application No: 2000-606976
Applicant: Fast Technology AG

European Patent Application No: 00912776.2
Applicant: Fast Technology AG

Israeli Patent Application No: 145533
Applicant: Fast Technology AG

4. Torque and Speed Sensor (FT Case Ref. 4)

US Patent Application No: 09/937,638
Assignee: Fast Technology GmbH
Inventors: Lutz May, John Owsley
Assignment recorded at USPTO on 2 January 2002

Japanese Patent Application No: 2000-608152
Applicant: Fast Technology AG

European Patent Application No: 9907130.0
Applicant: Fast Technology AG

Israeli Patent Application No: 145534
Applicant: Fast Technology AG

5. Longitudinal (Toroid) L1 Disc (FT Case Ref.5)

US Patent Application No: 10/049,323
Assignee: Fast Technology AG
Inventor: Lutz May
Assignment recorded at USPTO on 14 May 2002.

Japanese Patent Application No: 2001-517133
Applicant: Fast Technology AG

European Patent Application No: 00953303.5
Applicant: Fast Technology AG

Israeli Patent Application No: 148017
Applicant: Fast Technology AG

5a. Disc Sensor (FT Case Ref.5a)

US Patent Application No: 10/048322
Assignee: Fast Technology AG
Inventors: Lutz May
Assignment recorded at USPTO on 14 May 2002.

Japanese Patent Application No: 2001-517134
Applicant: Fast Technology AG

European Patent Application No: 00953308.4
Applicant: Fast Technology AG

Israeli Patent Application No: 148016
Applicant: Fast Technology AG

6. Accelerometer (FT Case Ref:6)

US Patent Application No: 10/110,007
Assignee: Fast Technology AG
Inventors: Lutz May
Assignment recorded at USPTO on 14 May 2003.

Japanese Patent Application No: 2001-530597
Applicant: Fast Technology AG

European Patent Application No: 00971326.4
Applicant: Fast Technology AG

Israeli Patent Application No: 148957
Applicant: Fast Technology AG

7. Strong Ambient Field Sensor (FT Case Ref:7)

US Patent Application No: 10/089,978
Assignee: Fast Technology AG
Inventor: Lutz May
Assignment recorded at USPTO on 14 May 2002.

Japanese Patent Application No: 2001-530548
Applicant: Fast Technology AG

European Patent Application No: 00972736.3
Applicant: Fast Technology AG

Israeli Patent Application No: 148954
Applicant: Fast Technology AG

8. Load Cell, Physical Force Sensing, Pressure Sensor (FT Case Ref:8)

US Patent Application No: 10/239,545
Assignee: Fast Technology AG
Inventors: Lutz May
Assignment recorded at USPTO on 18 December 2002.

Japanese Patent Application No: 2001-571064
Applicant: Fast Technology AG

07/08 '03 15:47 FAX

5

European Patent Application No:
Applicant: Fast Technology AG

Israeli Patent Application No: 151755
Applicant: Fast Technology AG

9. Longitudinal Process RS (1.2) (FT Case Ref:9)

US Patent Application No: 10/257,337
Assignee: Fast Technology AG
Inventors: Lutz May
Assignment recorded at USPTO on 11 February 2003.

Japanese Patent Application No: 2001-576421
Applicant: Fast Technology AG

European Patent Application No: 01931581.1
Applicant: Fast Technology AG

Israeli Patent Application No: 162176
Applicant: Fast Technology AG

10. (FT Case Ref:10) There are no active cases for this case, this being an investigation into a third party's patent some years ago.

11. Automatic Field Refresh Disc (FT Case Ref:11)

US Patent Application No: 10/258,275
Assignee: Fast Technology AG
Inventors: Lutz May
Assignment recorded at USPTO on 27 January 2003.

Japanese Patent Application No: 2001-586430
Applicant: Fast Technology AG

European Patent Application No: 01943403.4
Applicant: Fast Technology AG

Israeli Patent Application No: 152142
Applicant: Fast Technology AG

12. Axial Movement Compensating TS (FT Case Ref:12)

US Patent Application No: 10/297,980
Assignee: Fast Technology AG
Inventors: Lutz May
Assignment recorded at USPTO on 22 April 2003.

Japanese Patent Application No: 2002-510906

Applicant: Fast Technology AG

European Patent Application No: 01960281.2
Applicant: Fast Technology AG

Israeli Patent Application No: 183088
Applicant: Fast Technology AG

13. Hollow Shaft (FT Case Ref:13)

US Patent Application No: to be advised – awaiting official filing receipt

Inventor/Applicant: Lutz May

Assignment document from Lutz May to Fast Technology dated 21 March 2003 received by Lloyd Wise and forwarded to US attorney on 4 April 2003 – we are awaiting confirmation of recordal of the assignment from the USPTO.

Japanese Patent Application No: 2002-527746
Applicant: Fast Technology AG

European Patent Application No: 01962269.1
Applicant: Fast Technology AG

Israeli Patent Application No: 184855
Applicant: Fast Technology AG

14. Centre Magnet (FT Case Ref:14)

International Patent Application No: PCT/EP02/00788
Applicant: Fast Technology AG
Inventors: Lutz May

15. Portable Sensor Unit (FT Case Ref:15)
International Patent Application No: PCT/EP02/00784
Applicant: Fast Technology AG
Inventors: Lutz May

16. Axial Shift Measurement (FT Case Ref:16)

This case was cognated with the axial movement compensation TS case (case 12) as an international application – see case 12 above.

17. Angle Sensor (FT Case Ref:17)

International Patent Application No: PCT/EP01/13698
Applicant: Fast Technology AG
Inventors: Lutz May

18. Helical Coil – L1 Magnetisation (FT Case Ref:18)

07/08 '03 15:48 FAX

7

International Patent Application No: PCT/EP02/01226
Applicant: Fast Technology AG
Inventors: Lutz May

19. Automatic Gain Control Compensation (FT Case Ref:19)

International Patent Application No: PCT/EP02/01704
Applicant: Fast Technology AG
Inventors: Lutz May

20. Maintenance Free High Precision Force Sensor (FT Case Ref:20)

International Patent Application No: PCT/EP02/01230
Applicant: Fast Technology AG
Inventors: Lutz May

21. Micro Coil Field Sensor (FT Case Ref:21)

International Patent Application No: PCT/EP02/08820
Applicant: Fast Technology AG
Inventors: Lutz May, Georg Guntze

22. Plug Programmable Interface Unit (FT Case Ref:22)

International Patent Application No: PCT/EP02/04871
Applicant: Fast Technology AG
Inventors: Lutz May

28-23. Impact Torque Measurement (FT Case Ref:23)

International Patent Application No: PCT/EP0
Applicant: Fast Technology AG
Inventors: Lutz May

24. AC Disc Sensor -- PM Magnetism (FT Case Ref:24)

International Patent Application No: PCT/EP02/06300
Applicant: Fast Technology AG
Inventors: Lutz May

25. Depausing Unit (FT Case Ref:25)

This case has been abandoned.

26. Non-Encoded Sensor Host (FT Case Ref:26)

International Patent Application No: PCT/EP02/13952
Applicant: Fast Technology AG
Inventors: Lutz May

32030

27. Torque Loss Measurement (FT Case Ref:27)

This case has been abandoned.

28. Improved Torque Pulse Processing (FT Case Ref:28)

The case has been abandoned.

29. Rotational Non-Uniformity Detection (FT Case Ref:29)

International Patent Application No: PCT/EP02/14520
Applicant: Fast Technology AG
Inventors: Lutz May

(30) Pulse Torque Measurement APC (FT Case Ref:30)

International Patent Application No: PCT/EP03/01908
Applicant: Fast Technology AG
Inventors: Lutz May

US Patent Application No: to be advised - awaiting official filing receipt

Assignee: -
Inventors: Lutz May
Awaiting signed Assignment document from Lutz May - sent to Fast Technology for signature on 28 February 2003; document not received by Lloyd Wise as of 7 August 2003.

(31) Linear Displacement Transducer (FT Case Ref:31)

International Patent Application No: PCT/EP03/01907
Applicant: Fast Technology AG
Inventors: Lutz May

US Patent Application No: 10/373,634

Assignee: -
Inventors: Lutz May
Awaiting signed Assignment document from Lutz May - sent to Fast Technology for signature on 28 February 2003; document not received by Lloyd Wise as of 7 August 2003.

(32) Linear Position Sensor (FT Case Ref:32)

International Patent Application No: PCT/EP03/04355
Applicant: Fast Technology AG
Inventors: Lutz May; Georg Cuntze

US Patent Application No: 10/419,995

Assignee: -
Inventors: Lutz May; Georg Cuntze
Awaiting signed Assignment document from Lutz May and Georg Cuntze - sent to Fast Technology for signature on 25 April 2003; document not received by Lloyd Wise as of 7 August 2003.

07/08 '03 15:48 FAX

9

33. Crossed Sensor Arrangement (FT Case Ref:33)

This case has yet to be filed.

34. Torque Sensor Adaptor (Gofath) (FT Case Ref:34)

British Patent Application No: 0219745.7
Applicant: Fast Technology AG
Inventors: Lutz May, David L Kelly

37. Wireless Torque Transducer (FT Case Ref:37)

British Patent Application No: 0222296.8
Applicant: Fast Technology AG
Inventors: unknown

38. (FT Case Ref:38)

This case was not handled by Lloyd Wise.

39. (FT Case Ref:39)

British Patent Application No: 0303841.1
Applicant: Fast Technology AG
Inventors: Unknown

LLOYD WISE
7 August 2003

07/08 '03. 18:45 ~~KAT~~

'ASSIGNMENTS' -> FRODO-BAGGINS -- KAZIN! Page: 8

12/8/01 7:49 PAGE 2/4 RightFAX

ASSIGNMENTS

①



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20531

DECEMBER 06, 2001

PTAS

FLATT, KAIN, GIBBONS, GUTMAN & BONGTNU
ROBERT C. KAIN, JR.
750 S.E. THIRD AVENUE, SUITE 100
FT. LAUDERDALE, FL. 33316-1153

700009085A

• 7000080854

UNITED STATES PATENT AND TRADEMARK OFFICE
OFFICE OF RECORDATION OF ASSIGNMENT DOCUMENT

U. THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT DIVISION OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE MICROFILM COPY IS AVAILABLE AT THE ASSIGNMENT SEARCH ROOM ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT AND TRADEMARK ASSIGNMENT SYSTEM. IF YOU SHOULD FIND ANY ERRORS OR HAVE QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE EMPLOYEE WHOSE NAME APPEARS ON THIS NOTICE AT 703-308-9723. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, ASSIGNMENT DIVISION, BOX ASSIGNMENTS, CG-4, 1213 JEFFERSON DAVIS HWY, SUITE 320, WASHINGTON, D.C. 20231.

RECORDATION DATE: 12/05/2001

REEL/FRAME: 012213/0682
NUMBER OF PAGES: 3

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:

MAY, LUTZ AXEL

DOC DATE: 11/08/2001

ASSIGNMENT:

FAST TECHNOLOGY AG
OTTO HARN STRASSE 24
GENESEEDEICT RIEMERLING
D-85521 OTTOMUN, WFM REP GERMANY

SERIAL NUMBER: 09423888
PATENT NUMBER:

FILING DATE: 11/12/1999
ISSUE DATE:

SHAREILL COLES, EXAMINER
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

ASS:
PRF:
- 100
- 200
:
:
ST

07/08 '03 13:49 FAX

054 768 0158;

Dec-13-01 11:48AM;

Page 3/0

008*FTL--KAIN;
11 12/ 4/01 (103444)

CPR/ASSIGNMENTS -> FK008*FTL--KAIN; Page 2

ASSIGNMENTS

8/01 7:48 PAGE 2/4 RightFA

①



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Assistant Secretary and Commissioner
of Patents and Trademarks
Washington, D.C. 20231

DECEMBER 06, 2001

PTAS

FLIT, KAIN, GIBBONS, GUTMAN & BONGTINT
ROBERT C. KAIN, JR.
750 S.E. THIRD AVENUE, SUITE 100
FT. LAUDERDALE, FL 33316-1153

700009085A

700009085A

UNITED STATES PATENT AND TRADEMARK OFFICE
NOTICE OF RECORDATION OF ASSIGNMENT DOCUMENT

THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT DIVISION OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE MICROFILM COPY IS AVAILABLE AT THE ASSIGNMENT SEARCH ROOM ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT AND TRADEMARK ASSIGNMENT SYSTEM. IF YOU SHOULD FIND ANY ERRORS OR HAVE QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE EMPLOYEE WHOSE NAME APPEARS ON THIS NOTICE AT 703-308-9723. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, ASSIGNMENT DIVISION, BOX ASSIGNMENTS, CG-4, 1213 JEFFERSON DAVIS HWY, SUITE 320, WASHINGTON, D.C. 20231.

RECORDATION DATE: 12/05/2001

REEL/FRAME: 012213/0682
NUMBER OF PAGES: 3

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:

MAY, LUTZ AXEL

DOC DATE: 11/08/2001

ASSIGNEE:

FAST TECHNOLOGY AG
IM OTTO HAHN STRASSE 24
D-65521 OTTOBRUNN, FRIEDRICHSHAGEN
D-65521 OTTOBRUNN, FRIEDRICHSHAGEN

SERIAL NUMBER: 09423888

FILING DATE: 11/12/1999
ISSUE DATE:

PATENT NUMBER:

SHARILL COLES, EXAMINER
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

ACK
11/12/01
11/12/01
11/12/01

(3)



UNITED STATES
PATENT AND
TRADEMARK OFFICE

JANUARY 11 2002

PTAS

PLETT KAIN GIBBONS GUTMAN & BONGINI, PL
ROBERT C. KAIN, JR.
750 S.E. THIRD AVENUE
SUITE 100
FT. LAUDERDALE, FL 33316-1153

Chief Financial Officer and Chief Administrative Officer
Washington, DC 20231
www.uspto.gov



101929645A

UNITED STATES PATENT AND TRADEMARK OFFICE
NOTICE OF RECORDATION OF ASSIGNMENT DOCUMENT

THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT DIVISION OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE MICROFILM COPY IS AVAILABLE AT THE ASSIGNMENT SEARCH ROOM ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT AND TRADEMARK ASSIGNMENT SYSTEM. IF YOU SHOULD FIND ANY ERRORS OR HAVE QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE EMPLOYEE WHOSE NAME APPEARS ON THIS NOTICE AT 703-308-9723. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, ASSIGNMENT DIVISION, BOX ASSIGNMENTS, CG-4, 1213 JEFFERSON DAVIS HWY., SUITE 320, WASHINGTON, D.C. 20231.

RECORDATION DATE: 01/02/2002

REEL/FRAME: 012293/0292
NUMBER OF PAGES: 3

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:
MAY, LUTZ AXEL

DOC DATE: 11/08/2001

ASSIGNOR:
OWSLEY, JOHN

DOC DATE: 11/08/2001

ASSIGNEE:
FAST TECHNOLOGY GMBH
OTTO HAHN STR 24
GEWEREGEBIET RIEMERLING
D-85521 OTTOBRUNN, FED REP GERMANY

SERIAL NUMBER: 09937230
PATENT NUMBER:

FILING DATE:
ISSUE DATE:

MARCUS KIRK, EXAMINER
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

21-AUG-03 13:10

Von-Patentanwalte Becker Kurig Straus

+49 89 746 303 11

T-032 S.014/061 F-248

07/08 '03 15:49 FAX

By: FKGG8*FTL--KAIN;

954 768 0158;

Jan-7-02 10:38AM;

Page 2 (4)

01/08/03 11/4/02 3:52 PM

OPR/ASSIGNMENTS

MAILED

2 3:52 PAGE 2/4

RightFAX

4506

OPR/ASSIGNMENTS



UNITED STATES DEPARTMENT OF COMMERCE
Patents and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

JANUARY 02, 2002

PTAS
FRET, KAIN, GIBBONS, GUTMAN ET AL.
ROBERT C. KAIN, JR.
750 S.E. THIRD AVENUE, SUITE 100
FT. LAUDERDALE, FLORIDA 33316-1153

700009527A
700009527A

UNITED STATES PATENT AND TRADEMARK OFFICE
NOTICE OF RECORDATION OF ASSIGNMENT DOCUMENT

THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT DIVISION OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE MICROFILM COPY IS AVAILABLE AT THE ASSIGNMENT SEARCH ROOM ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT AND TRADEMARK ASSIGNMENT SYSTEM. IF YOU SHOULD FIND ANY ERRORS OR HAVE QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE EMPLOYEE WHOSE NAME APPEARS ON THIS NOTICE AT 703-308-9723. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, ASSIGNMENT DIVISION, BOX ASSIGNMENTS, CG-4, 1215 JEFFERSON DAVIS HWY, SUITE 320, WASHINGTON, D.C. 20231.

RECORDATION DATE: 01/02/2002

REEL/FRAME: 012267/0328
NUMBER OF PAGES: 6

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:
MAY, LUTZ AXEL

DOC DATE: 11/08/2001

ASSIGNOR:
OWSLKY, JOHN

DOC DATE: 12/07/2001

ASSIGNEE:
FAST TECHNOLOGY GMBH
OTTO HAHN STR 24
GEWERBEGEBIET RIEMERLING
D-85521 OTTOKRUM, FED REP GERMANY

SERIAL NUMBER: 09937638
PATENT NUMBER:

FILING DATE:
ISSUE DATE:

MARY BERTON, EXAMINER
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

OPR/ASSIGNMENTS

14/02 2:06 PAGE 2/4 RightFA

5



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

MAY 14, 2002

PTAS
FLEIT, KAIN, GIBBONS, GUTMAN ET AL.
ROBERT C. KAIN, JR.
750 S.E. THIRD AVENUE
SUITE 100
FT. LAUDERDALE, FLORIDA 33316-1153

700012982A

*700012982A

UNITED STATES PATENT AND TRADEMARK OFFICE
NOTICE OF RECORDATION OF ASSIGNMENT DOCUMENT

THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT DIVISION OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE MICROFILM COPY IS AVAILABLE AT THE ASSIGNMENT SEARCH ROOM ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT AND TRADEMARK ASSIGNMENT SYSTEM. IF YOU SHOULD FIND ANY ERRORS OR HAVE QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE EMPLOYEE WHOSE NAME APPEARS ON THIS NOTICE AT 703-308-9723. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, ASSIGNMENT DIVISION, BOX ASSIGNMENTS, CG-4, 1213 JEFFERSON DAVIS HWY, SUITE 320, WASHINGTON, D.C. 20231.

RECORDATION DATE: 05/14/2002

REEL/FRAME: 012686/0623
NUMBER OF PAGES: 3

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:
MAY, LUTZ AXEL

DOC DATE: 05/03/2002

ASSIGNEE:
FAST TECHNOLOGY AG
OTTO HAHN STR 24
GEWERBERGEBIET RISMERING
D-85521 OTTOBRUNN, FED REP GERMANY

SERIAL NUMBER: 10049323
PATENT NUMBER:

FILING DATE:
ISSUE DATE:

JERVON JONES, EXAMINER
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

07/08 '03-15:50 FAX

854 768 0158;

May-21-02 1:40PM;

By: FRANK FIL--KAIN;

OPR/ASSIGNMENTS

5/02 2:10 PAGE 2/4 Right FAX

5a



UNITED STATES DEPARTMENT OF COMMERCE
 Patent and Trademark Office
 Assistant Secretary and Commissioner
 of Patents and Trademarks
 Washington, D.C. 20231

MAY 14, 2002

FTAS
 FLEIT, KAIN, GIBBONS, GUTMAN & ET AL
 ROBERT C. KAIN, JR.
 750 S.E. THIRD AVENUE, SUITE 100
 FT. LAUDERDALE, FLORIDA 33316-1153

700012984A

700012984A

UNITED STATES PATENT AND TRADEMARK OFFICE
 NOTICE OF RECORDATION OF ASSIGNMENT DOCUMENT

THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT DIVISION OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE MICROFILM COPY IS AVAILABLE AT THE ASSIGNMENT SEARCH ROOM ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT AND TRADEMARK ASSIGNMENT SYSTEM. IF YOU SHOULD FIND ANY ERRORS OR HAVE QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE EMPLOYER WHOSE NAME APPEARS ON THIS NOTICE AT 703-309-9123. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, ASSIGNMENT DIVISION, BOX ASSIGNMENTS, CG-4, 1213 JEFFERSON DAVIS HWY, SUITE 320, WASHINGTON, D.C. 20231.

RECORDATION DATE: 05/14/2002

REEL/FRAME: 012686/0684
 NUMBER OF PAGES: 3

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:
 MAY, LUTZ AXEL

DOC DATE: 05/03/2002

ASSIGNEE:
 FAST TECHNOLOGY AG
 OTTO HAIN STR. 24, GEMERBEGBIET
 RIMMELING
 D-85521 OTTOMUNN, FED REP GERMANY

SERIAL NUMBER: 10049322
 PATENT NUMBER:

FILING DATE:
 ISSUE DATE:

VIOLET MCCOY, EXAMINER
 ASSIGNMENT DIVISION
 OFFICE OF PUBLIC RECORDS

07/08 '03 15:50 FAX

954 788 0158;

May-21-02 11:40 AM

BY: FRANK FIL-KAIN

5/14/02 2:11 PAGE 2/4 RightFAX

OPR/ASSIGNMENTS



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

MAY 14, 2002

PTAS

FLHIT, KAIN, GIBSON, GUTMAN & ET AL
ROBERT C. KAIN JR.
750 S.E. THIRD AVENUE
SUITE 100
FT. LAUDERDALE, FLORIDA 33316-1153

700012985A

700012985A

UNITED STATES PATENT AND TRADEMARK OFFICE
NOTICE OF RECORDATION OF ASSIGNMENT DOCUMENT

THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT DIVISION OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE MICROFILM COPY IS AVAILABLE AT THE ASSIGNMENT SEARCH ROOM ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT AND TRADEMARK ASSIGNMENT SYSTEM. IF YOU SHOULD FIND ANY ERRORS OR HAVE QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE EMPLOYEE WHOSE NAME APPEARS ON THIS NOTICE AT 703-308-9723. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, ASSIGNMENT DIVISION, BOX ASSIGNMENTS, CO-4, 1213 JEFFERSON DAVIS HWY, SUITE 320, WASHINGTON, D.C. 20231.

RECORDATION DATE: 05/14/2002

REEL/FRAME: 012696/0687
NUMBER OF PAGES: 3

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:
MAY, LUTZ AXEL

DOC DATE: 05/03/2002

ASSIGNEE:
FAST TECHNOLOGY AG
OTTO HAHN STR 24
GEWERBEGASSE 12 RIMMERLING
D-85521 OTTBRUNN, FED REP GERMANY

SERIAL NUMBER: 10110007
PATENT NUMBER:

FILING DATE:
ISSUE DATE:

THERESA FREDERICK, EXAMINER
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

21-AUG-03 13:11
07/08 '03 10:00 FAX
BY: FKGB*FTL--KAIN:
IN/ASSIGNMENTS

Von-Patentanwaeltte Becker Kurig Straus

+49 89 748 303 11

T-032 S.018/061 F-248

854 768 0158

May-21-02 11:41PM;

Page 12/14

5/02 2:10 PAGE 2/4 NightFAX



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20531

MAY 14, 2002

PTAS

FLEIT, KAIN, GIBBONS, GUTMAN & ET AL
ROBERT C. KAIN JR.
750 S.E. THIRD AVENUE, SUITE 100
FT. LAUDERDALE, FLORIDA 33316-1153

700012983A

700012983A

UNITED STATES PATENT AND TRADEMARK OFFICE
NOTICE OF RECORDATION OF ASSIGNMENT DOCUMENT

THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT DIVISION OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE MICROFILM COPY IS AVAILABLE AT THE ASSIGNMENT SEARCH ROOM ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT AND TRADEMARK ASSIGNMENT SYSTEM. IF YOU SHOULD FIND ANY ERRORS OR HAVE QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE EMPLOYEE WHOSE NAME APPEARS ON THIS NOTICE AT 703-308-9723. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, ASSIGNMENT DIVISION, BOX ASSIGNMENTS, CG-4, 1213 JEFFERSON DAVIS HWY, SUITE 320, WASHINGTON, D.C. 20231.

RECORDATION DATE: 05/14/2002

REEL/FRAME: 012686/0681
NUMBER OF PAGES: 3

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:
MAY, LUTZ AXEL

DOC DATE: 05/03/2002

ASSIGNEE:
FAST TECHNOLOGY AG
OTTO HAHN STR 24
GEWERBEGEBIET RIEMERLING
D-86521 OTTOBRUNN, FED REP GERMANY

SERIAL NUMBER: 10089978
PATENT NUMBER:

FILING DATE:
ISSUE DATE:

JOHN STEWART, EXAMINER
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

21-AUG-03 13:12

Von-Patentanwalte Becker Kurig Strauß

+49 89 746 303 11

T-032 S.018/081 F-248

07/08 '03 10:30 FAX

BY: HKEGH=PTL--KAINI

854 788 0158

Dec-20-02

2115PM

12/20/02 1:45PM

OPR/ASSIGNMENTS

FRANK-PTL--KAINI, FAX

OPR/ASSIGNMENTS

12/20/02 1:33 PAGE 2/4 RightFAX



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Assistant Secretary and Commissioner
of Patent and Trademarks
Washington, D.C. 20231

DECEMBER 20, 2002

FEAS
FLINT, KAIN, GIBSON, GUTMAN, ET AL
ROBERT C. KAIN, JR.
750 SOUTHEAST THIRD AVENUE, SUITE 100
FT. LAUDERDALE, FLORIDA 33316-1153

700021638A

-700021638A

UNITED STATES PATENT AND TRADEMARK OFFICE
NOTICE OF RECORDATION OF ASSIGNMENT DOCUMENT

THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT DIVISION OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE MICROFILM COPY IS AVAILABLE AT THE ASSIGNMENT SEARCH ROOM ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT AND TRADEMARK ASSIGNMENT SYSTEM. IF YOU SHOULD FIND ANY ERRORS OR HAVE QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE EMPLOYEE WHOSE NAME APPEARS ON THIS NOTICE AT 703-308-9723. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, ASSIGNMENT DIVISION, BOX ASSIGNMENTS, CG-4, 1215 JEFFERSON DAVIS HWY, SUITE 320, WASHINGTON, D.C. 20231.

RECORDATION DATE: 12/18/2002

REEL/FRAME: 013306/0938
NUMBER OF PAGES: 3

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:
MAY, LUTZ AXEL

DOC DATE: 09/26/2002

ASSIGNEE:
FAST TECHNOLOGY AG
OTTO HAHN STR 24, GEWERBERGELAND
RIEMERLING
D-85521 OTTOBRUNN, FED REP GERMANY

SERIAL NUMBER: 10239545
PATENT NUMBER:

FILING DATE:
ISSUE DATE:

ALLYSON FURNELL, EXAMINER
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

2/19/03 11:02 PAGE 2/4 RightFAX

9



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

FEBRUARY 12, 2003

PTAS

FLEIT, KAIN ET AL.
ROBERT C. KAIN, JR.
750 SOUTHEAST THIRD AVENUE
SUITE 100
FT. LAUDERDALE, FL 33316-1153

700024058A

700024058A

UNITED STATES PATENT AND TRADEMARK OFFICE
NOTICE OF RECORDATION OF ASSIGNMENT DOCUMENT

THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT DIVISION OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE MICROFILM COPY IS AVAILABLE AT THE ASSIGNMENT SEARCH ROOM ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT AND TRADEMARK ASSIGNMENT SYSTEM. IF YOU SHOULD FIND ANY ERRORS OR HAVE QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE EMPLOYEE WHOSE NAME APPEARS ON THIS NOTICE AT 703-308-9723. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, ASSIGNMENT DIVISION, BOX ASSIGNMENTS, CG-4, 1213 JEFFERSON DAVIS HWY, SUITE 320, WASHINGTON, D.C. 20231.

RECORDATION DATE: 02/11/2003

REEL/FRAME: 013424/0613
NUMBER OF PAGES: 4

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:
MAY, LOUIZ AXEL

DOC DATE: 10/15/2002

ASSIGNEE:
FAST TECHNOLOGY AG
OTTO HAHN STR. 24
GEWERBEGEBIET REIDERLING, D-85521
OTTODORN, FED REP GERMANY

SERIAL NUMBER: 10257337
PATENT NUMBER:

FILING DATE:
ISSUE DATE:

STEVEN POST, EXAMINER
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

21-AUG-03 13:12

Von-Patentanwalte Becker Kurig Straus

+49 89 746 303 11

T-032 S.021/081 F-246

07/08 '03 13:01 FAX
By: FKGBB*FTL--KAIN;

854 788 0158;

Jan-29-03 8:40PM;

RIGHTFAX



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

JANUARY 28, 2003

PTAB

FLSIT, KAIN, GIBBONS, GUTMAN, ET AL.
ROBERT C. KAIN, JR.
780 S.E. THIRD AVENUE
STE. 100
FT. LAUDERDALE, FL 33316-1133

700023128A

700023128A

UNITED STATES PATENT AND TRADEMARK OFFICE
NOTICE OF RECORDATION OF ASSIGNMENT DOCUMENT

THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT DIVISION OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE MICROFILM COPY IS AVAILABLE AT THE ASSIGNMENT SEARCH ROOM ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT AND TRADEMARK ASSIGNMENT SYSTEM. IF YOU SHOULD FIND ANY ERRORS OR HAVE QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE EMPLOYER WHOSE NAME APPEARS ON THIS NOTICE AT 703 306-9723. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, ASSIGNMENT DIVISION, BOX ASSIGNMENTS, CG-4, 1213 JEFFERSON DAVIS HWY, SUITE 320, WASHINGTON, D.C. 20231.

RECORDATION DATE: 01/27/2003

REEL/FRAME: 013385/0738
NUMBER OF PAGES: 3

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:

MAY, LUTS AXEL

DOC DATE: 10/15/2002

ASSIGNEE:

FAST TECHNOLOGY AG
OTTO HAHN STR 24
GEWERBEGEBIET RIEMERLING
D-85521 OTTERBUCH, FED REP GERMANY

SERIAL NUMBER: 10250275

PATENT NUMBER:

FILING DATE:

ISSUE DATE:

SILVIA BROOKS, EXAMINER
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

(12)

ASSIGNMENTS



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APRIL 22, 2003

PTAS

FLAHERTY, KAIN, GIBSONS ET.AL.
ROBERT C. KAIN
790 S.E. TRIED AVENUE, SUITE 100
FT. LAUDERDALE, FL 33316-1153

700028498A
-700028498A

UNITED STATES PATENT AND TRADEMARK OFFICE
NOTICE OF RECORDATION OF ASSIGNMENT DOCUMENT

THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT DIVISION OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE MICROFILM COPY IS AVAILABLE AT THE ASSIGNMENT SEARCH ROOM ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT AND TRADEMARK ASSIGNMENT SYSTEM. IF YOU SHOULD FIND ANY ERRORS OR HAVE QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE EMPLOYEE WHOSE NAME APPEARS ON THIS NOTICE AT 703-308-9723. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, ASSIGNMENT DIVISION, BOX ASSIGNMENTS, CG-4, 1213 JEFFERSON DAVIS HWY, SUITE 320, WASHINGTON, D.C. 20231.

RECORDATION DATE: 04/22/2003

REEL/FRAME: 013587/0460
NUMBER OF PAGES: 3

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:
MAY, LOTZ AXEL

DOC DATE: 12/04/2002

ASSIGNEE:
EAST TECHNOLOGY AG
OTTO HARM STR 24
GEWEREGEBIET RIEMERLING
D-85821 OTTOBRUNN, FED REP GERMANY

SERIAL NUMBER: 10297980
PATENT NUMBER:

FILING DATE:
ISSUE DATE:

PAULA MCCRAY, EXAMINER
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

Internal Title: Torque/Force
 Official Title: Magnetising Arrangement for Torque/Force Sensor

Case#Alt.	Appl. #	filing date	priority (file#)	priority date	publication #	designated countries	patent #	date of grant	status	remarks	current actions
57159	43832	23.04.1998	GB 9808792.7	23.04.1998	WO 99/58089	all			ended	positive preliminary international examination report	none
9808792.7	PCT/GB99/00736	11.03.1999	GB 9808792.7	23.04.1998					pending	request for examination has to be filed by 11.03.07	none
23.04.1998	2000-546211	11.03.1999	GB 9808792.7	23.04.1998					pending	cost issue: 2000€ to be paid by 8th April 2003	none
	44837	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44838	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44839	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44840	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44841	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44842	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44843	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44844	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44845	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44846	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44847	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44848	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44849	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44850	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44851	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44852	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44853	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44854	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44855	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44856	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44857	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44858	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44859	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44860	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44861	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44862	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44863	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44864	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44865	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44866	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44867	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44868	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44869	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44870	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44871	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44872	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44873	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44874	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44875	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44876	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44877	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44878	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44879	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44880	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44881	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44882	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44883	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44884	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44885	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44886	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44887	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44888	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44889	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44890	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44891	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44892	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44893	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44894	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44895	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44896	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44897	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44898	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44899	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44900	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44901	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44902	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44903	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44904	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44905	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44906	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44907	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44908	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44909	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44910	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44911	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44912	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44913	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44914	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44915	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44916	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44917	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44918	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44919	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44920	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44921	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44922	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44923	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44924	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44925	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44926	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44927	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44928	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44929	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44930	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44931	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44932	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44933	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44934	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44935	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44936	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44937	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44938	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44939	11.03.1999	GB 9808792.7	23.04.1998					pending		none
	44940	11.03.1999									

Internal Title:	Torque & Speed
Official Title:	Torque and Speed Sensor

[illegible]

AZ 4

Internal Title: Longitudinal Toroid. Longitudinal Toroid. Disc Sensor

Official Title: Longitudinally Magnetised Transducer (GB)

Magnetised Transducer Element for Torque or Force Sensor (PCT)

Casa#Alt.	57859	44719	44720	45734	45735	45736	45737	45738	45739
Appl. #	9918085.4	PCT/GB00/03119	PCT/GB00/03125	2001-517133	2001-517134	10049.323	10049.322		
filing date	12.08.1998	14.08.2000	14.08.2000	14.08.2000	14.08.2000	14.08.2000	14.08.2000		
priority (file#)		GB 9918085.4	GB 9918085.4	GB 9918085.4	GB 9918085.4	GB 9918085.4	GB 9918085.4		
priority date		12.08.1998	12.08.1998	12.08.1998	12.08.1998	12.08.1998	12.08.1998		
publication #		WO 01/13081	WO 01/13082						
designated		all	all						
countries		-	-						
patent #		-	-						
date of grant									
status		pending?	pending	ended	pending request for examination	pending request for examination	pending	pending	pending
remarks					has to be filed by 14.08.07	has to be filed by 14.08.07	has to be filed by 14.08.07	has to be filed by 14.08.07	has to be filed by 14.08.07
current actions	none	none	none	none	none	none	none	none	none

Applications named with *(1) belong to PCT(1), applications named with *(2) belong to PCT(2). The later are to be found in file internal #5a

AZ 585A

45732	45727	45733	45728
00953303.5	00953308.4	148017	148016
14.08.2000	14.08.2000	14.08.2000	14.08.2000
GB 9919085.4	GB 9919085.4	GB 9919085.4	GB 9919085.4
12.08.1999	12.08.1999	12.08.1999	12.08.1999
1203209	1203210		

pending

pending

pending

pending

none

none

none

none

AZ 585A

Internal Title: Accelerometer
Official Title: Accelerometer

Case#Att.	Appl. #	filing date	priority (file#)	priority date	publication #	designated countries	patent #	date of grant	status	remarks	current actions
57721	9923894.1	08.10.1999									
44773	PCT/EP00/09783	05.10.2000	GB 9923894.1	08.10.1999	WO 01/27638	all			ended		none
45836	2001-530597	05.10.2000	GB 9923894.1	08.10.1999					pending	request for examination has to be filed by 05.10.07	none
45835	10/110,007	05.10.2000	GB 9923894.1	08.10.1999					pending		none
45834	00871326.4	05.10.2000	GB 9923894.1	08.10.1999	1221055				pending		none
45837	148857	05.10.2000	GB 9923894.1	08.10.1999					pending		none

AZ 8

Internal Title: Torque Measurement
 Official Title: Torque Measurement Apparatus

Case#Att.	Appl. #	filing date	priority (file#)	priority date	publication #	designated countries	patent #	date of grant	status	remarks	current actions
57722	9924046.7	11.10.1999							lapsed		
44774	PCT/EP00/10022	10.10.2000	GB 9924046.7	11.10.1999	WO 01/27594	all			ended	proceeded through preliminary examination	none
45840	2001-530548	10.10.2000	GB 9924046.7	11.10.1999					pending	request for examination has to be filed by 10.10.07	none
45899	10/089,978	10.10.2000	GB 9924046.7	11.10.1999					pending		none
45938	00972736.3	10.10.2000	GB 9924046.7	11.10.1999						proceed to grant the patent!	proceed to grant the patent!
45841	148954	10.10.2000	GB 9924046.7	11.10.1999					pending		none

AZ 7

Internal Title: L2 Patent RS Process
Official Title: Magnetic Transducer Element and Method of Preparation

	England	Wales	Jersey	US	EU
Case#Ail.	57815	415209	40100	46158	46158
Appl. #	0009492.0	PCT/EP01/04077	2001-578421		152178
filing date	17.04.2000	10.04.2001	10.04.2001	10.04.2001	10.04.2001
priority (file#)	-	GB 0009492.0		01931581.1	
priority date	-	17.04.2000			
publication #		WO 01/78801			
designated countries	-	all	-	-	
patent #		-			
date of grant		-			
status	lapsed	pending entry into national/regional phase by 17.10.2002	ongoing	ongoing	ongoing
remarks			regional phase	regional phase	regional phase
current actions	none	none			

Internal Title: TRW-Joint Patent
Official Title: Power Steering Mechanism with Magnetoelectric Torsion Bar

Case#Alt. J4188/4
Case#Tarditi TRW (M) 4278
Appl. # 09/516,382
filing date 28.02.2000
priority (file#)
priority date
publication #
designated
countries
patent # 6,360,841
date of grant 28.03.2002
status granted
remarks joint application
current actions together with TRW
none

AZ 10

Internal Title: Automatic Field Refresh
 Official Title: Magnetic-based Torque/Speed Sensor

Case#	Appl. #	filing date	priority (file#)	priority date	publication #	designated countries	patent #	date of grant	status	remarks	current actions
57834	0012228.7	19.05.2000	-	-	-	-	-	-	lapsed	-	none
43278	PCT/EP01/05705	17.05.2001	GB 0012226.7	18.05.2000	WO 01/0711	all	-	-	pending preliminary examination requested	since Dec 2002	proceeding
46137	2001-586430	17.05.2001	-	-	-	-	-	-	proceeding	-	proceeding

AZ 11

Internal Title: Axial Movement Compensated Torque
 Official Title: Magnetic Transducer Torque Measurement

Case#Alt.	57835	43237	46262	46254	46251	48263
Appl. #	0014568.0	PCT/EP01/06482	2002-510906	not yet known	01960281.2	153088
filing date	14.06.2000	07.06.2001		07.06.2001	07.06.2001	07.06.2001
priority (file#)	-	GB 0014568.0				
priority date	-	GB 0025036.5				
publication #	-	14.06.2000				
designated countries	-	12.10.2000				
patent #	-	WO 01/96826				
date of grant	-	all				
status	lapsed	pending	proceeding national phase since Dec 02	proceeding national phase since Dec 02	proceeding national phase since Dec 02	proceeding national phase since Dec 02
remarks		preliminary examination requested	examination must be requested by 7th June 2008			
current actions	none	none				

AZ 12

Internal Title: Torque Sensing Inside Shaft
 Official Title: Magnetic Torque Sensor System

Case # 0022315.6 15477

Case #	0022315.6	PCT/EP01/10438
Appl. #	12.09.2000	11.09.2001
filing date		GB 0022315.6
priority (file#)		12.09.2000
priority date		WO 02/23146
publication #		all
designated		
countries		
patent #		
date of grant		
status	lapsed	pending
remarks		preliminary
		examination
		requested
current actions	none	none

AZ 13

Internal Title: Centre Magnet
Official Title: Magnetisation of Magnetic Transducer

[illegible]

Case #	App. #	filing date	priority (file#)	priority date	publication #	designated	countries	patent #	date of grant	status	remarks	current actions
57887	0101882.7	25.01.2001	-	-	-	-	all	-	-	lapsed		none
45634	PCT/EP02/00786	24.01.2002	GB 0101882.7	25.01.2001	WO 02/058556					pending	preliminary examination requested	none

Internal Title: Portable Sensor Unit
 Official Title: Portable Magnetic Transducer

Casus#Att 57888 45530

Appl. #	0101881.9	PCT/EP0200784
filing date	25.01.2001	24.01.2002
priority (file#)	-	GB 0101881.9
priority date	-	25.01.2001
publication #	-	WO 02/059555
designated countries	-	all
patent #	-	-
date of grant	-	-
status	lapsed	pending preliminary examination
remarks	-	-
current actions	none	none

AZ 15

Internal Title: Axial Shift Measurement
 Official Title: Magnetic Transducer System

67906

Appl # 0025036.5
 filing date 12.10.2000
 priority (file#)
 priority date
 publication #
 designated
 countries
 patent #
 date of grant
 status
 remarks
 current actions none

Priority of this GB-Application was claimed for PCT-Application Internal#12 (Case# Atl. 45287)

Internal Title: Helical Coil-L1 Mag.
 Official Title: Longitudinally-Magnetised Transducer

Case/Att.	IPC Class.	IPC Class.	IPC Class.	IPC Class.
57036	45725			
Appl. #	0103036.0	PCT/EP0201225		
filing date	07.02.2001	06.02.2002		
priority (file#)	-	0103036.0		
priority date	-	07.02.2001		
publication #	-	WO 02/083262		
designated	-	all		
countries	-	-		
patent #	-	-		
date of grant	-	-		
status	lapsed	pending		
remarks		search report		
current actions	none	issued		
		none		

AZ 18

Internal Title: AGC Compensation
 Official Title: Magnetic Transducer Measurement

Case#	App. #	filling date	priority (file#)	priority date	publication #	designated countries	patent #	date of grant	status	remarks	current actions
57957	0104408.8	22.02.2001	-	-	-	-	-	-	pending		
	PCT/EP02/01704	18.02.2002	GB 0104408.8	22.02.2001	WO01/27584	all	-	-	pending	search report issued to be taken by 22nd Aug 2003	action on national phase to be taken by 22nd Aug 2003
										action on national phase to be taken by 22nd Aug 2003	action on national phase to be taken by 22nd Aug 2003
											none

AZ 18

Internal Title: Bar Mag
 Official Title: Measurement of Tension in Running Thread (GB)
 Force Sensor Device (PCT)

Case#	App. #	filing date	priority (file#)	priority date	publication #	designated countries	patent #	date of grant	status	remarks	current actions
57972	0103037.8	07.02.2001	-	-	-	-	-	-	lapsed	-	none
45886	PCT/EP02/01230	08.02.2002	GB 0103037.8	07.02.2001	WO02/071018	all	-	-	pending	enter international preliminary examination until 07.09.02	none

AZ 20

Internal Title:
Official Title:

Micro Coil Field
Sensor
Magnetic Field Sensor

Case#Att. 57985 46022
Appl. # 0119476.6 PCT/EP02/08820
filing date 09.08.2001 07.08.2001
priority (file#)
priority date
publication #
designated
countries
patent #
date of grant
status
remarks
current actions
pending
decision about
further applications
claiming priority

AZ 21

Internal Title:
Official Title:

Plug Programmable Interface
Data Transfer Protocol

Case#Att. 58018 45738

Appl. # 0111482.8

filing date 10.05.2001

priority (file#)

priority date

publication #

designated

countries

patent #

02.05.2002

GB 0111482.8

10.05.2001

WO 02/090891

all

date of grant

14. Nov 02

status

lapsed

remarks

current actions none

action on national phase to be taken by 10th Nov 2003
action on national phase to be taken by 10th Nov 2003
action on national phase to be taken by 10th Nov 2003
action on national phase to be taken by 10th Nov 2003

AZ 22

Internal Title: Sensing and Measuring Torque of Impact Torque Tools
Official Title: Impact Torque Tool

Case#Alt. 53025 45881

Appl. # 0115494.7

filing date 25.08.2001

priority (file#)

GB 0115494.7->
AZ 23

priority date

25.07.2001->AZ 23

publication #
designated
countries

patent #

date of grant

status

pending

remarks

priority of this
application was
claimed together
with priorities of
Internal #27 and
#28 for a single
PCT-application
see AZ 28

current actions none

AZ 23

Internal Title: AC-Disc Sensor Pulse Modulated Magnetisation
Official Title: Disc Magnetic Torque Sensing

[illegible]

Internal Title: Degaussing Unit
Official Title: Degaussing Apparatus

Case#Alt.

58028

Appl. #

01274839

filing date

15.11.2001

priority (file#)

priority date

publication #

designated

countries

patent #

date of grant

status

pending

PCT-application to

be filed by 15

November 2002

remarks

none

current actions

AZ 25

Internal Title: Non-encoded Sensor Host
 Official Title: Magnetic Torque Transducer

Case#All 58082 46270

Appl. # 0129510.4

filing date 10.12.2001

priority (file#)

priority date

publication #

designated

countries

patent #

date of grant

status

remarks

current actions none

proceeding

proceeding

proceeding

proceeding

proceeding

pending

AZ 28

Internal Title: Torque Loss Measurement
Official Title: Torque Loss Measurement

Case#Alt	58092	45881
Appl. #	0128509.6	
filing date	10.12.2001	
priority (file#)	-	GB 0128509.6
priority date	-	10.12.2001->AZ 27
publication #		
designated countries		
patent #		
date of grant		
status	pending	
remarks		priority of this application was claimed together with priorities of Internal #23 and #28 for a single PCT-application see AZ 28
current actions	none	

AZ 27

Internal Title: Improved Torque Pulses Processing
Official Title: Power Torque Tool

58101 0129511.2 45881 PCT/EP0206860

Case#Att. 58101 0129511.2 45881 PCT/EP0206860
Appl. # 0129511.2
filing date 10.12.2001
priority (file#) -

priority date - GB 0129511.2

publication # 10.12.2001->AZ 28
designated countries -

patent # -
date of grant -

status pending

remarks see AZ 23/281

current actions none

AZ 28

Internal Title: Rotational Non-Uniformity Detection
Official Title: Detecting Magnetic Rotational Non-uniformity

Case#Att.

58104

46284

Appl. #

0128882.5

filing date

14.12.2001

priority (file#)

13.12.2002

priority date

14.12.2001

publication #

designated

countries

patent #

date of grant

allowed to lapse

status

remarks

current actions

none

AZ 29

Internal Title: Pulsed Torque Measurement APC
Official Title: Pulsed Torque Measurement

Case#ALL

58117

Appl. # 0204213.3

filing date 22.02.2002

priority (file#)

priority date

publication #

designated

countries

patent #

date of grant

status

remarks

current actions

proceed further til 22.Feb 2003!

advised Jan 24.03

AZ 30

Internal Title: Linear Displacement Transducer
 Official Title: Magnetic-Based Transducer For Measuring Displacement

Case#ATL

58129

App. # 0205534.1

filing date

08.03.2002

priority (file#)

08.03.2002

publication #

designated

countries

patent #

date of grant

status

remarks

pending

current actions

become a PCT?

act until 8. March 2003

advised Jan 24.03

AZ 31

Internal Title: **Linear Position Sensor**
Official Title: **Magnetic Displacement Sensor**

Case#Alt. 58141

Appl. # 0209240.1

filing date

23.04.2002

priority (file#)

23.04.2002

priority date

23.04.2002

publication #

designated

countries

patent #

date of grant

status

pending

remarks

current actions

become a PCT?

act until 23.04.2003

advised Jan 24.03

AZ 32

Crossed Sensor Arrangement

Internal Title:
Official Title:

58148

Case#Alt

Appl. #

filing date

priority (file#)

priority date

publication #

designated

countries

patent #

date of grant

status

remarks

current actions

?

in preparation

none

AZ 33

Internal Title: Torque Sensor Adaptor (Goliath)
Official Title: Torque Sensor Adaptor (Goliath)

Case#Alt

58479

Appl. # 0219745.7

filing date

23.08.2002

priority (file#)

priority date

publication #

designated

countries

patent #

date of grant

status

filed

remarks

current actions

none

AZ 34

Torque and Angle Measurement

Internal Title:
Official Title:

Caselists

Appl. #
filing date
priority (file#)
priority date
publication #
designated
countries
patent #
date of grant
status
remarks
current actions

In preparation

AZ 35

Internal Title: non-contact torque and linear position sensing

Official Title:

Class/Att:

Appl. #

filing date

priority (file#)

priority date

publication #

designated

countries

patent #

date of grant

status

remarks

current actions

in preparation

AZ 36

Internal Title: non-contact, electrical power producing torque transducer for pulse tool applications

Official Title:

58185

Case#Att

Appl. #

filing date

priority (file#)

priority date

publication #

designated

countries

patent #

date of grant

status

remarks

current actions

0222296.6

25.09.2002

In preparation

AZ 37

Internal No. (A2)	Product Name	PLC Name	PLC Order	PLC	APM Number	UD	UDK
28	Selecting Magnetic Relational Non-Uniformity	Relational Non-Uniformity Detection, RSJ Detection	14712/2001	58104	48284	0498802.5	
30	Pulsed Torque Measurement	Pulsed Torque Measurement APC	2202/2002	58117	48380	0204213.3	
31	Pulsed Torque Measurement	Linear Displacement Transducer	2202/2002	58129	48401	0204534.1	
32	Magnetic Displacement Sensor	Linear Position Sensor	2304/2002	58157 58141	48502	0208240.1	
33	Torque Sensor Adapter	Crossed Sensor Adapter (Gibbs)	2302/2002	58148			
34		Torque Sensor Adapter (Gibbs)	2302/2002	58178		0218745.7	
35		Force-measuring device					
36		non-contact, electrical force producing torque					
37		torque sensor for force and torque	2002/2002			0202008.6	
38		Signal Processing & Control for a Power Torque Tool	18722/2002	03285EP			
39	Measuring the weight of a load	Measuring the weight of a load	19032/2003	58344		0303841.1	
40		Short magnification processing		58178			
41		Combined length/angle sensor		58174			
42		Torque rate control		58175			
43		Transducer measurement on tool bit		58178			
44		Diff. free torque measurement		58190			

zu diesen Anmeldungen haben wir
keine detaillierten Angaben.
Kurz

ANNEX II

Summa 14

GLEICHENSTEIN & BREITLING
Rechtsanwälte

Dr. Hans von Gleichenstein

Maximilian Breitling

Rechtsanwalt
Vereidigter Buchprüfer
Fachanwalt für Insolvenzrecht

Rechtsanwalt
Fachanwalt für Insolvenzrecht

RAe Gleichenstein & Breitling, Rottmannstraße 11 A, 80333 München

Herrn
Dr. Lutz May
Wolfratshauser Straße 23 A

82538 Geretsried

Telefon 089 / 54 27 30 0

Telefax 089 / 54 27 30 15

Email rae@gleichenstein-und-koll.de

Internet www.gleichenstein-und-koll.de

Rottmannstraße 11 A

(Stiglmaierplatz)

80333 München

Datum	unser Zeichen	bei Rückfragen	GerichtsAZ	Ihr Zeichen
22.03.2004	00/000149	GL/dt	1507 IN 1724/03	

Insolvenzverfahren über das Vermögen der Firma
FAST Technology AG, Otto-Hahn-Str. 29, 85521 Ottobrunn
Hier: Inventar und Bilanz, „Sale and Transfer Agreement“ mit Firma MDI

Sehr geehrter Herr May,

in meinem obengenannten Vertrag mit MDI habe ich mich verpflichtet, alles zu tun, um MDI die Inhaberschaft an sämtlichen IP's zu verschaffen. Die Kollegen Becker, Kurig, Straus haben Sie für MDI bereits aufgefordert, durch Unterzeichnung der notwendigen Erklärungen und Vollmachten dazu beizutragen, dass die erforderlichen Umschreibungen in den jeweiligen ausländischen Patentbehörden erfolgen können. Mit Schreiben vom 09.03.2004 haben Ihre anwaltschaftlichen Vertreter abgelehnt, Ihnen zur Unterzeichnung eines erbetenen Assignments zu raten. Ich wende mich daher in meiner Eigenschaft als Insolvenzverwalter der Firma FAST Technology AG direkt an Sie.


Sie wissen ganz genau, dass die entsprechenden IP's der Schuldnergesellschaft zustehen. Soweit entsprechende Rechte noch auf Ihren Namen lauten und eine dingliche Übertragung noch nicht stattgefunden haben sollte, sind Sie, was Ihnen ebenfalls bewusst ist, aufgrund des mit FAST Technology AG geschlossenen Dienstvertrages bzw. aufgrund Ihrer ehemaligen Stellung als gesetzlicher Vertreter dieser Gesellschaft verpflichtet, die erforderlichen Erklärungen zur Übertragung solcher Rechte abzugeben. Der Anspruch der Gesellschaft gegen die ehemaligen gesetzlichen Vertreter bzw. gegen ehemalige Mitarbeiter wurde mit dem oben genannten Kaufvertrag auf MDI übertragen. Mit Ihrer Weigerung, eindeutig der FAST zustehende immaterielle Vermögenswerte dieser zur Verwertung zu überlassen, begeben Sie sich in gefährliche Nähe möglicher strafrechtlicher Tatbestände. Ich möchte nicht versäumen Sie hierauf nachdrücklich hinzuweisen.


Sie werden hiermit zur Vermeidung einer gerichtlichen Auseinandersetzung aufgefordert, das erbetene Assignment nunmehr unverzüglich, spätestens aber bis zum

07.04.2004

den Patentanwälten Becker, Kurig, Straus wie von diesen erbeten vorzulegen. Nach erfolglosem Fristablauf werden sich gerichtliche Maßnahmen nicht vermeiden lassen.

Mit freundlichen Grüßen

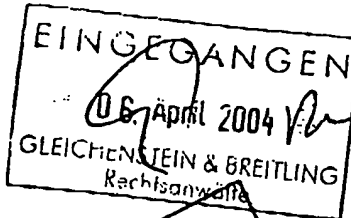
 Dr. Hans von Gleichenstein
Rechtsanwalt und vBP als Insolvenzverwalter



ANNEX III

Per Fax vorab an: 089-54 27 30-15

Herrn
Dr. Hans von Gleichenstein



Bestätigungsexemplar
Vorab als Telefax übermittelt

München · Hamburg · Düsseldorf
New York

Patentanwälte
Dr. Walter Maiwald (München)
Dr. Volker Hamm (Hamburg)
Dr. Stefan Michalski (Düsseldorf)
Dr. Regina Neufeld (München)
Dipl.-Ing. Udo Preuss (München)
Dipl.-Ing. Karbinian Kopf, M.A. (München)
Dr. Norbert Hansen (München)
Dipl.-Ing. Lutz Kietzmann LL.M. (Düsseldorf)
Dr. Martin Huenges (München)
Dr. Holger Glas (München)
Dr. Vera Tiefbrunner (München)
Dr. Sigrid von Krosigk (Hamburg)

Rechtsanwälte
Stephan N. Schneller (München)
Matthias Gottschalk, MBA (München)

In Kooperation mit:
Maiwald Inc.,
European IP Services, New York
Dipl.-Ing. Karbinian Kopf, M.A.
U.S. Patent Agent

Ihr Zeichen

Unser Zeichen
N 7157 / KK

Durchwahl 3:
74 72 66-19

München,
5. April 2004

NCT-ENGINEERING GmbH
Geplante Patentanmeldung
Magnetischer Sensor

Sehr geehrter Herr Dr. von Gleichenstein,

bezugnehmend auf Ihr Schreiben an Herrn Lutz May vom 22. März 2004, das an uns weitergeleitet wurde, liegen anscheinend Missverständnisse vor, die wir hoffen mit diesem Schreiben ausräumen zu können.

Zunächst ist festzustellen, dass Herr Lutz May jederzeit bereit ist, die entsprechenden Erklärungen /Unterschriften in den FAST Schutzrechten abzugeben, sobald uns Dokumente, wie beispielsweise das von Herrn Straus von Becker Kurig & Straus in seinem Schreiben an uns vom 10. März 2004 angegebene "Patent Transfer Deed", das sich laut Aussagen von Herrn Straus in seinen Akten befindet, die eine Übertragung der Schutzrechte von Herrn Lutz May auf Fast belegen, vorgelegt werden. Wir haben schon wiederholt bei dem Kollegen Herrn Straus von Becker Kurig & Straus nachgefragt uns eine Kopie dieses Patent Transfer Deeds zur Verfügung zu stellen, da wir keine Kopie dieses Dokuments in unseren Akten haben.

Sollte jedoch solch ein Patent Transfer Deed oder eine ähnliche Übertragungserklärung oder KK:pl

- 2 -

Inanspruchnahmeerklärung durch FAST nicht existieren, vertreten wir die Auffassung, dass die von Herrn Lutz May während seiner Tätigkeit für FAST getätigte Erfindungen nach § 8 Abs. 1 Nr. 3 ArbEG frei geworden sind, da der Arbeitgeber sie nicht innerhalb von 4 Monaten nach Eingang der Erfindungsmeldung in Anspruch genommen hat. Diese Freigabe wirkt ex tunc; die originär in der Person des Arbeitnehmers begründete Dienstleistung verbleibt dann bei dem Arbeitnehmer als Rechtsinhaber. Die Erfindung ist dann frei von dem Aneignungsrecht des Arbeitgebers gemäß § 6 Abs. 1 ArbEG. Es ist kein Rechtsübergang erfolgt und nach § 8 Abs. 2 ArbEG kann der Arbeitnehmer dann frei über die Dienstleistung verfügen. Laut Arbeitsvertrag bzw. Dienstvertrag zwischen Herrn Lutz May und FAST ist unzweifelhaft das ArbEG anwendbar.

Lediglich ergänzend sei in diesem Zusammenhang darauf hinzuweisen, dass, falls entgegen unserer obigen Auffassung ein Rechtsübergang stattgefunden hat, Herrn Lutz May im Falle einer Insolvenz bei Veräußerung der Dienstleistung ohne den Geschäftsbetrieb nach § 27 Abs. 2 ArbEG ein Vorkaufsrecht gehabt hätte.

Wir würden Sie bitten, zur obigen Betrachtung Stellung zu nehmen und uns darauf hinzuweisen, falls Ihrer Auffassung nach die obige Betrachtung falsch ist oder eventuell auf falschen Tatsachen beruht.

Wir möchten noch mal darauf hinweisen, dass Herr Lutz May grundsätzlich bereit ist, bei entsprechenden Nachweis eines Rechtsübergangs an FAST die entsprechenden Unterschriften/Erklärungen abzugeben. Ferner wäre Herr Lutz May gerne bereit, die Schutzrechte beispielsweise gegen eine Freilizenz auf Sie oder MDI zu übertragen. Auch wären Fragen der Unterlizenzierung oder einer Abgrenzungsvereinbarung zu alten MDI-Patenten zu diskutieren.

Wir hoffen, dass wir mit diesem Schreiben Missverständnisse ausräumen konnten und bitten Sie bei Rückfragen jederzeit mit uns in Verbindung zu treten.

cc: Herrn Lutz May

Herrn Sven Fritsche

Mit freundlichen Grüßen
Maiwald Patentanwalts GmbH


(Korbmann/Kopf)

ANNEX IV

Ticket

Warte-/Arbeitszeit in Min.
bestätigt durch: (Unterschrift)

☐ €

Fahrtpreis (netto)

☐ €

Warte-/Arbeitszeit (netto)

Datum 24.08.2005 Wg.-Nr. 207

von Bauvariastr. 7

nach Inselkammerstr. 10

LA. WENIG KURIG STRAUS
BECKMANN & CO.
STRASSE 7 · 80336 MÜNCHEN

Stempel / Unterschrift des Auftraggebers

A. Sawall
 Unterschrift des Empfängers
A. SAWALL

Kd.-Nr.

Bei eventuellen Reklamationen rufen Sie bitte unsere Verwaltung an:
 Telefon 0 89 / 45 48 45-0.
 EUROKURIER arbeitet ausschließlich nach den Bedingungen des HGB. Dem Kunden sind die Transportbedingungen von Eurokurer bekannt. Er erkennt diese Bedingungen als verbindlich für den vorliegenden Transportauftrag an.

Ticket

Warte-/Arbeitszeit in Min.
bestätigt durch: (Unterschrift)

☐ €

Fahrtpreis (netto)

☐ €

Warte-/Arbeitszeit (netto)

Datum 24.08.2005 Wg.-Nr. 207

von Bauvariastr. 7

nach Inselkammerstr. 10

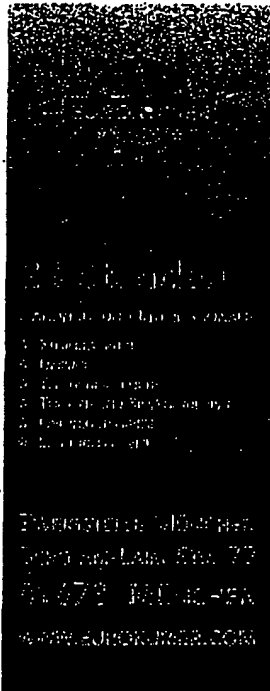
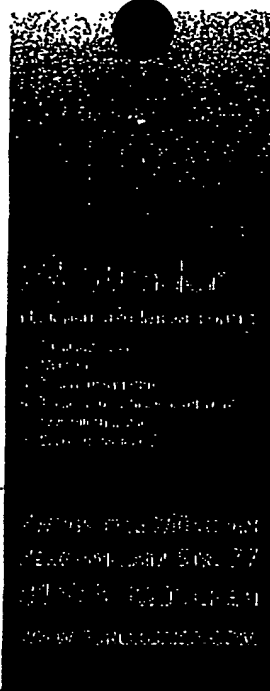
LA. WENIG KURIG STRAUS
BECKMANN & CO.
STRASSE 7 · 80336 MÜNCHEN

Stempel / Unterschrift des Auftraggebers

A. Sawall
 Unterschrift des Empfängers

Kd.-Nr.

Bei eventuellen Reklamationen rufen Sie bitte unsere Verwaltung an:
 Telefon 0 89 / 45 48 45-0.
 EUROKURIER arbeitet ausschließlich nach den Bedingungen des HGB. Dem Kunden sind die Transportbedingungen von Eurokurer bekannt. Er erkennt diese Bedingungen als verbindlich für den vorliegenden Transportauftrag an.





Becker, Kurig, Strauss
Patentanwälte
Bavariastr. 7
80336 München

BECKER KURIG STRAUS	
BAVARIASTRASSE 7 80336 MÜNCHEN	
31. Aug. 2005	
WV:	LF:

Sehr geehrte Damen und Herren,

hiermit bestätigen wir die ordnungsgemäße Abgabe der Kuriersendungen
von oben genannter Anschrift, an den Empfänger
in Unterhaching 82008, Inselkarnerstr. am 24.08.2005.

Mit freundlichen Grüßen

Th. Meyenberg

EUROKURIER
Transport oHG
Klausenburger Strasse 9
81677 München
Tel.: 089/45 49 45 0

EUROKURIER

24-STUNDEN SERVICE

089/45 49 45 0

0 700 7 EUROKURIER

WWW.EUROKURIER.COM

INFO@EUROKURIER.COM

24-STUNDEN SERVICE

089/45 49 45 0

0 700 7 EUROKURIER

WWW.EUROKURIER.COM

INFO@EUROKURIER.COM

BAKVERBUND GbR

HYPOVORRECHT

MÜNCHEN

KTO-NR. 1700 202 000

BLZ 700 202 70

GESCHAFTSFÜHRER:

WERNER SEIDL

UST-NR. DE 179332167

ST-NR. 607/79931

GERICHTSTAND MÜNCHEN

HRA 75539

ANNEX V

DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, mailing address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention

entitled: TORQUE SENSOR ADAPTOR

the specification of which

☐ is attached hereto

☒ was filed on August 22, 2003 as United States Application Number or PCT International

Application Number PCT/EP2003/009349 and (if applicable) was amended on _____

I hereby authorize our attorneys to insert the serial number assigned to this application.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 USC §119			
APPLICATION NO.	COUNTRY	DAY/MONTH/YEAR FILED	PRIORITY CLAIMED

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

PROVISIONAL APPLICATION(S) UNDER 35 U.S.C. §119(e)	
APPLICATION NUMBER	FILING DATE

I hereby claim the benefit under 35 U.S.C. §120 of any United States application, or §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. §112.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

PRIOR U.S./PCT INTERNATIONAL APPLICATION(S) DESIGNATED FOR BENEFIT UNDER 35 U.S.C. §120		
APPLICATION NO.	FILING DATE	STATUS — PATENTED, PENDING, ABANDONED

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith: Victor M. Wigman, Reg. No. 25,201; George C. Myers, Jr., Reg. No. 27,040; Donald R. Greene, Reg. No. 22,470; Michael C. Greenbaum, Reg. No. 28,419; Charles R. Wolfe, Jr., Reg. No. 28,680; Michael D. White, Reg. No. 32,795; Brian C. Jones, Reg. No. 37,857; David J. Edmondson, Reg. No. 35,126; Denise C. Lane, Reg. No. 42,780; Peter Weissman, Reg. No. 40,220; Brian WM. Higgins, Reg. No. 48,443; Minh-Quan K. Pham, Reg. No. 50,594; Thomas L. Willis, Jr., Reg. No. 53,778; and Tara L. Hoffman, Reg. No. 46,510.

Correspondence Address:

Blank Rome LLP
 600 New Hampshire Avenue, N.W.
 Washington, DC 20037
 TEL (202) 772-5800 FAX (202) 572-8398
 Customer No: 27557

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of sole or first inventor (given name, family name): David KELLY	
Signature:	Date:
Residence: c/o Fast Technology AG, Otto-Hahn-Strasse 24, Gewerbegebiet Riemerling, 8551 Ottobrunn Germany	Citizenship: British
Mailing Address: Same as residence.	

Full Name of additional joint inventor (given name, family name): Lutz Axel MAY	
Signature:	Date:
Residence: Wolfratshauser Strasse 23a, 82538 Gelting Germany	Citizenship: German
Mailing Address: Same as residence.	

Full Name of additional joint inventor (given name, family name):	
Signature:	Date:
Residence:	Citizenship:
Mailing Address: Same as residence.	

Full Name of additional joint inventor (given name, family name):	
Signature:	Date:
Residence:	Citizenship:
Mailing Address: Same as residence.	

Full Name of additional joint inventor (given name, family name):
--

☐ *Additional joint inventors are named on separately numbered sheets attached hereto.*

ASSIGNMENT

THIS ASSIGNMENT, made on the date set forth below by Lutz Axel May, a German citizen, residing at Wolfratshauser Strasse 23a, Geretsried, 82538, Germany, hereinafter referred to as ASSIGNOR, witnesseth:

WHEREAS, said ASSIGNOR has invented certain new and useful improvements in TORQUE SENSOR ADAPTOR set forth in an International Application filed on August 22, 2003, in the office of the International examining authority and accorded Application No. PCT/EP03/09349, and set forth in a corresponding British application,

WHEREAS Abas, Inc., a Delaware corporation having a principal place of business at 7401 W. Wilson Avenue, Chicago, Illinois 60706, is desirous of acquiring the entire right, title and interest in and to said invention as set forth in said patent applications in the United States and around the world;

NOW, THEREFORE, for good and valuable consideration, receipt of which is hereby acknowledged, ASSIGNOR, by these presents does sell, assign, and transfer unto said ASSIGNEE, the entire right, title, and interest in and to the above-mentioned invention, said patent application for Letters Patent, and any and all Letters Patent or Patents in the United States of America and all foreign countries which may be granted therefor and thereon, and in and to any and all divisions, continuations, and continuations-in-part of said application, or reissues or extensions of said Letters Patent or Patents, and all rights under the International Convention for the Protection of Industrial Property, the same to be held and enjoyed by the said ASSIGNEE, for its own use and behoof and the use and behoof of its successors, legal representatives and assigns, to the full end of the term or terms for which Letters Patent or Patents may be granted, as fully and entirely as the same would have been held and enjoyed by the ASSIGNOR, had this assignment not been made.

ALSO, ASSIGNOR hereby agrees to execute any documents that legally may be required in connection with the filing, prosecution and maintenance of said application or any other patent application(s) or inventor certificate(s) in the United States and in foreign countries for said Letters Patent, including additional documents that may be reasonably required to affirm the rights of ASSIGNEE in and to said invention and Letters Patent, all without further consideration.

ASSIGNOR also agrees, without further consideration and at ASSIGNEE'S expense, to identify and communicate to ASSIGNEE at ASSIGNEE'S reasonable request documents and information concerning the invention that are within ASSIGNOR'S possession or control, and to provide further assurances and testimony on behalf of ASSIGNEE that lawfully may be required of ASSIGNOR in respect of the prosecution, maintenance and defense of any patent application or patent encompassed within the terms of this instrument. ASSIGNOR'S obligations under this instrument shall extend to ASSIGNOR'S heirs, executors, administrators and other legal representatives.

ALSO, ASSIGNOR hereby authorizes and requests that the examination authority in any and all states to issue any and all Letters Patents or Patents referred to above to ASSIGNEE, as the ASSIGNEE of the entire right, title and interest in and to the same, for ASSIGNEE'S sole use and behoof; and for the use and behoof of ASSIGNEE'S legal representatives and successors, to the full end of the term for which such Letters Patent or Patents may be granted, as fully and entirely as the same would have been held by ASSIGNOR had this assignment not been made.

ALSO, ASSIGNOR authorizes any member of the firm of Blank Rome LLP to insert or complete any information in this document needed to effect its recordal in the U.S. Patent & Trademark Office.

Effective this ____ day of _____ [month], in the year _____.

Lutz A. May

[Signature]

The foregoing instrument was subscribed and sworn before me this _____ day of _____, 2004, by Lutz A. May.

Notary Public

My Commission Expires: _____

**THE OFFICIAL DATE STAMPED HEREON BY THE U.S. PATENT AND
TRADEMARK OFFICE WILL ACKNOWLEDGE RECEIPT OF THE FOLLOWING:**

Applicants: David KELLY et al.
Serial No.: To Be Assigned
Filing Date: February 23, 2005
For: TORQUE SENSOR ADAPTOR

ENCLOSURES:

- Transmittal Letter to the United States Designated/Elected Office (in duplicate)
- Preliminary Amendment
- Specification, claims and abstract (19 pages)
- Drawings (2 Sheets)
- Unexecuted Declaration (2 pages)
- Information Disclosure Statement with references
- Recordation of Assignment Cover Sheet w/Assignment
- Check No. _____ in the amount of \$1,440

CRW/BWH:dlc
February 23, 2005

Attorney Docket No. 119508-00281

BLANK ROME LLP

**THE OFFICIAL DATE STAMPED HEREON BY THE U.S. PATENT AND
TRADEMARK OFFICE WILL ACKNOWLEDGE RECEIPT OF THE FOLLOWING:**

Applicants: David KELLY et al.
Serial No.: To Be Assigned
Filing Date: February 23, 2005
For: TORQUE SENSOR ADAPTOR

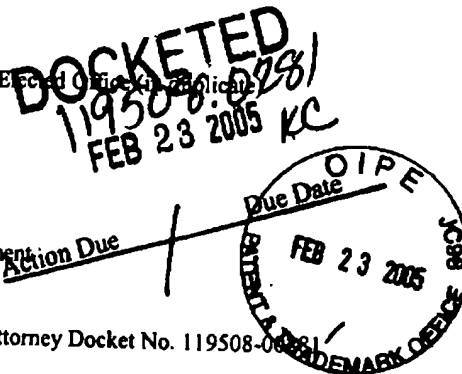
ENCLOSURES:

- Transmittal Letter to the United States Designated/Elected Office (in duplicate)
- Preliminary Amendment
- Specification, claims and abstract (19 pages)
- Drawings (2 Sheets)
- Unexecuted Declaration (2 pages)
- Information Disclosure Statement with references
- Recordation of Assignment Cover Sheet w/Assignment
- Check No. 12698 in the amount of \$1,440

CRW/BWH:dlc
February 23, 2005

Attorney Docket No. 119508-00281

BLANK ROME LLP



BLANK ROME LLP

CHECK NO.

12698

VENDOR #	INVOICE #	DATE	INVOICE AMOUNT	INVOICE DESCRIPTION	AMOUNT PAID
00896	119508-00281	02-23-05	1,440.00	NATIONAL PHASE PATENT APPLICATION BASIC FEE: \$300. EXAM FEE: \$200. SEARCH FEE: \$500. EXTRA CLAIM FEE: \$200. EXTRA INDEPENDENT CLAIM FEE: \$200. ASSIGNMENT RECORDATION FEE: \$40	1,440.00

THE FACE OF THIS DOCUMENT HAS A COLORED BACKGROUND THAT IS SENSITIVE TO CHEMICAL ALTERATION AND FLUORESCENT FIBERS WHEN EXPOSED TO ULTRAVIOLET LIGHT.

BLANK ROME LLP

COUNSELORS AT LAW
600 NEW HAMPSHIRE AVENUE, NW
WASHINGTON, DC 20037
(202) 944-3000

CHECK NO. 12698

WASHINGTON DISBURSEMENT ACCT
55-138/312

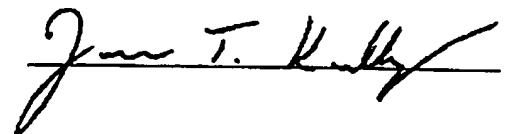
02/23/05

ONE THOUSAND FOUR HUNDRED FORTY AND 00/100 DOLLARS

\$1,440.00

PAY TO THE ORDER OF U.S. COMMISSIONER OF PATENTS
AND TRADEMARKS

VENDOR REF:

COMMERCE BANK
DELAWARE

⑈ 12698 ⑈ 10311010171 95 00000 42 ⑈

THIS DOCUMENT CONTAINS INFORMATION OF THE U.S. GOVERNMENT AND IS NOT TO BE RELEASED TO THE PUBLIC WITHOUT THE WRITTEN PERMISSION OF THE U.S. GOVERNMENT

**THE OFFICIAL DATE STAMPED HEREON BY THE U.S. PATENT AND
TRADEMARK OFFICE WILL ACKNOWLEDGE RECEIPT OF THE FOLLOWING:**

Applicants: David KELLY et al.
Serial No.: To Be Assigned
Filing Date: February 23, 2005
For: TORQUE SENSOR ADAPTOR

ENCLOSURES:

- Transmittal Letter to the United States Designated/Elected Office (in duplicate)
- Preliminary Amendment
- Specification, claims and abstract (19 pages)
- Drawings (2 Sheets)
- Unexecuted Declaration (2 pages)
- Information Disclosure Statement with references
- Recordation of Assignment Cover Sheet w/Assignment
- Check No. _____ in the amount of \$1,440

CRW/BWH:dlc
February 23, 2005

Attorney Docket No. 119508-00281

BLANK ROME LLP

**THE OFFICIAL DATE STAMPED HEREON BY THE U.S. PATENT AND
TRADEMARK OFFICE WILL ACKNOWLEDGE RECEIPT OF THE FOLLOWING:**

Applicants: David KELLY et al.
Serial No.: To Be Assigned
Filing Date: February 23, 2005
For: TORQUE SENSOR ADAPTOR

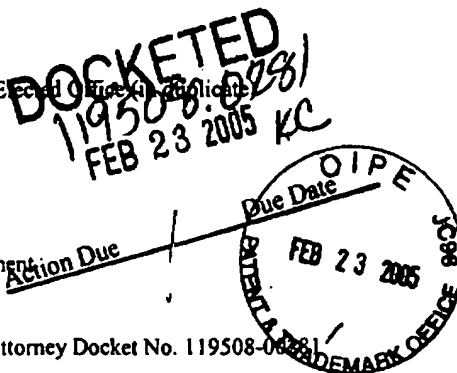
ENCLOSURES:

- Transmittal Letter to the United States Designated/Elected Office (in duplicate)
- Preliminary Amendment
- Specification, claims and abstract (19 pages)
- Drawings (2 Sheets)
- Unexecuted Declaration (2 pages)
- Information Disclosure Statement with references
- Recordation of Assignment Cover Sheet w/Assignment
- Check No. 12698 in the amount of \$1,440

CRW/BWH:dlc
February 23, 2005

Attorney Docket No. 119508-00281

BLANK ROME LLP



Under the Paperwork Reduction Act

of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		KEYS DOCKET NUMBER 119508-00281
		U.S. APPLICATION NO. (if known, see 37 CFR 1.5) Not yet assigned
INTERNATIONAL APPLICATION NO. PCT/EP2003/009349	INTERNATIONAL FILING DATE August 22, 2003	PRIORITY DATE CLAIMED August 23, 2002
TITLE OF INVENTION TORQUE SENSOR ADAPTOR		
APPLICANT(S) FOR DO/EO/US David KELLY et al.		
The undersigned herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below. 4. <input checked="" type="checkbox"/> The US has been elected (Article 31). 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) a. <input type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau). b. <input checked="" type="checkbox"/> has been communicated by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). a. <input checked="" type="checkbox"/> is attached hereto. b. <input type="checkbox"/> Has been previously submitted under 35 U.S.C. 154(d)(4). 7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau). b. <input type="checkbox"/> have been communicated by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input checked="" type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). 10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). Items 11 to 20 below concern document(s) or information included: 11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98 12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input checked="" type="checkbox"/> A preliminary amendment. 14. <input type="checkbox"/> An Application Data Sheet under 37 CFR 1.76. 15. <input type="checkbox"/> A substitute specification. 16. <input type="checkbox"/> A power of attorney and/or change of address letter. 17. <input type="checkbox"/> A computer readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 37 CFR 1.821 - 1.825. 18. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4). 19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4). 20. <input checked="" type="checkbox"/> Other items or information: Form PTO-1449 and references		

This collection of information is required by 37 CFR 1.414 and 1.491-1.492. The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 15 minutes to complete, including gathering information, preparing and submitting the completed form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Under the Patent Reduction Act of 1995, no persons are required to respond to a survey or questionnaire unless it displays a valid OMB control number.

J.S. APPLICATION NO. (if known, see 37 CFR 1.5) Not yet assigned		INTERNATIONAL APPLICATION NO. PCT/EP2003/009349		ATTORNEY'S DOCKET NO. 119508-00281	
The following fees have been submitted				CALCULATIONS PTO USE ONLY	
21. <input checked="" type="checkbox"/> Basic national fee..... \$300				\$ 300	
22. <input checked="" type="checkbox"/> Examination fee International preliminary examination report prepared by USPTO and all claims satisfy provisions of PCT Article 33(1)-(4)..... \$100 All other situations..... \$200				\$ 200	
23. <input checked="" type="checkbox"/> Search fee Search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as an International Searching Authority..... \$100 International Search Report prepared and provided to the Office..... \$400 All other situations..... \$500				\$ 500	
TOTAL OF 21, 22 and 23 =				\$1,000	
<input type="checkbox"/> Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing or computer program listing filed in an electronic medium). The fee is \$250 for each additional 50 sheets of paper or fraction thereof.					
Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof (round up to a whole number)	RATE		
- 100 =	/50 =		x \$250	\$	
Surcharge of \$130.00 for furnishing the oath or declaration later than 30 months from the earliest claimed priority date (37 CFR 1.402(h))				\$	
CLAIMS		NUMBER FILED	NUMBER EXTRA	RATE	
Total Claims		24 - 20 =	4	x \$ 50	\$ 200
Independent Claims		4 - 3 =	1	x \$200	\$ 200
MULTIPLE DEPENDENT CLAIM(S) (if applicable)				+ \$360	\$
TOTAL OF ABOVE CALCULATIONS =				\$	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. Fees above are reduced by 1/2.				\$	
SUBTOTAL =				\$1,400	
Processing fee of \$130.00 for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i)).				\$	
TOTAL NATIONAL FEE =				\$1,400	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				\$ 40	
TOTAL FEES ENCLOSED =				\$1,440	
				Amount to be refunded:	
				Amount to be charged:	

- a. ☒ A check in the amount of \$ 1,440 to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. 23-2185 in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 23-2185. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the international application to pending status.

SEND ALL CORRESPONDENCE TO:

CUSTOMER NO.: 27557
BLANK ROME LLP
 600 New Hampshire Avenue, N.W.
 Washington, D.C. 20037
 Tel: (202) 772-5800
 Fax: (202) 572-8398

Signature

Charles R. Wolfe, Jr.
 Name

28,680
 Registration No.

February 23, 2005
 Date

FORM PTO-1390 (REV. 02-2005)

APPLICATION FOR UNITED STATES LETTERS PATENT

TITLE: TORQUE SENSOR ADAPTOR

INVENTOR: David KELLY and Lutz Axel MAY

**BLANK ROME LLP
The Watergate
600 New Hampshire Avenue, NW
Washington, DC 20037
(202) 772-5800
(202) 572-8398 (facsimile)**

Docket No. 119508-00281

Title: Torque Sensor Adaptor

FIELD OF THE INVENTION

This invention relates to a torque transducer assembly and to a torque transducer incorporating such an assembly. The invention has particular
5 application to measuring torque in a fastening tool in which torque is generated in pulses and to measuring torque in an adaptor mountable to a pulsed-torque type of fastening tool.

The invention further relates to an electrical power generator for generating power from mechanical vibrations such as are generated in pulse-
10 type fastening tools.

BACKGROUND TO THE INVENTION

Considerable attention has been given in recent times to measuring the torque-generated in pulsed torque tools and controlling operation of the tool to achieve a pre-determined torque. Such tools may be sometimes referred to
15 as powered torque wrenches. They have been long used for applying a tightening torque to fasten nuts to bolts, or similar operations.

Pulsed torque tools include two categories. One in which an impact generates a torque impulse, such as rotary hammer and anvil mechanisms; the other in which a pulse of controlled characteristics is generated, such as
20 by a pressure pulse generated with the aid of a piston and cylinder mechanism. In both cases, a train of successive torque pulses is generated to produce increasing torque on the load being tightened. Impact-type tools may be electrically or pneumatically driven (e.g. compressed air). Pressure pulse-type tools may be hydraulically driven (e.g. oil) or electrically driven.
25 The torque pulses are generated at one end of an output shaft and are transmitted to an adaptor at the other end configured to fit the load such as a nut or bolt head.

The control of a power impact tool using a torque transducer is described in published U.S. patent application US2002/0020538A1. The torque transducer uses a ferromagnetic sensor and specifically discloses a magneto-elastic ring coupled to the output shaft of the tool. An impact tool
5 control method and apparatus is described in International patent application publication WO01/44776. The control system uses a magneto-elastic torque transducer mounted exteriorly of the tool in which the magneto-elastic transducer element is an integral portion of a shaft through which torque is transmitted. This document also discloses the implementation of the control
10 system as a retrofit system for use in controlling an existing impact tool.

PCT patent application PCT/EP02/06960 filed 24th June, 2002 discloses the control of a pulsed torque tool using magnetic-based torque
transducer which has a transducer element or region integral with the output
shaft of the tool. The control apparatus including the transducer disclosed in
15 this application is disposed interiorly of the power torque tool.

The present invention arises from addressing the problem of providing an adaptor attachable to a conventional power torque tool of the pulsed-type whereby torque measurement and control can be exercised on the tool. The invention is also concerned with measuring the torque generated on a load by
20 each pulse in order to exercise control of the application of torque to the load and particularly to stop operation of the power tool when a predetermined torque is reached. Another aspect of the invention also proposes using the mechanical vibration associated with the operation of a power torque tool to derive electrical energy for operating circuitry for the measurement and
25 control procedures. This aspect of the invention is of more general utility for generating electrical energy from mechanical vibration.

Aspects and features of this invention relating to a torque transducer assembly suitable for use in an adaptor are set forth in Claims 1 to 7 and 22

following this description. The invention also provides a torque transducer as set forth in Claim 8 to 10.

Aspects and features of this invention relating to an electrical power generator in accordance with this invention are set forth in Claims 11 to 20.

5 The generator may be mounted to a pulsed-type power torque tool.

The invention and its practice will be further described with reference to the accompanying drawings:

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a diagrammatic view of a torque sensor adaptor kit for a
10 conventional power torque tool in accordance with this invention;

Fig. 2 shows an axial cross-sectional view through an adaptor for use as the torque sensor adaptor shown in Fig. 1;

Fig. 3 shows an axial cross-sectional view through another torque sensor adaptor showing additional mechanical detail;

15 Fig. 4 illustrates a signal-processing feature employed in the measurement/control unit of Fig. 1;

Fig. 5 shows an axial view through one embodiment of a vibration-powered electrical generator unit according to the invention; and

20 Fig. 5a shows the coil of the unit connected with a rectifier for generating a direct voltage output.

DESCRIPTION OF EMBODIMENT OF ADAPTOR KIT

Fig. 1 shows a conventional power torque tool 10, such as an impact-type fastening tool which provides torque pulses at an output shaft 12. The tool illustrated is powered by compressed air through line 14. It is

conventional to fit a load-engaging adaptor on the end 12a of the shaft 12 distal the power tool for transmitting torque to the load, e.g. a nut or bolt head. Such an adaptor is exemplified in PCT/EP02/06960. The adaptor is a passive article for transmitting torque from the shaft to the load. As described in
5 PCT/EP02/06960, the disclosure of which is hereby incorporated by reference, torque measurement and control is performed within the tool body 10.

In accordance with one aspect of the present invention a kit including a torque sensor adaptor 20 is provided to enable torque measurement and
10 control to be exercised on a conventional pulsed torque tool not containing such provision. The adaptor 20 couples to the tool output shaft at one end and receives a conventional passive adaptor for engaging a load at the other end. The adaptor incorporates a torque transducer arrangement using a magnetic-based torque transducer element. The adaptor 20 can be
15 characterised as an active device in contrast to prior passive devices. In the kit illustrated the torque-dependent signals from the sensor arrangement in adaptor 20 are supplied over cable connection 22 to a signal processing and controller unit 30 which in turn supplies a shut-off signal over cable connection 32 to an air-valve unit 40 acting in line 14. The unit 30 may include a display
20 34, e.g. an LCD display, for displaying relevant parameters on a manually actuable key pad 36 for entering control instructions and data to a programmed microprocessor (not shown) housed in unit 30. The unit 30 can be mounted or carried so as to be free of the vibration generated in operation of the tool 10. As schematically illustrated by chain lines 24 the adaptor 20
25 has a body portion 26 which is securable or attachable to the body of the power tool 10 as will be described below. The adaptor has a torque transmitting shaft extending through the body and having an output end 28.

Fig. 2 shows one form of construction for the adaptor 20 which is constructed to transmit torque about an axis A-A. It is a general aim of the

construction to keep the axial length of the torque transmitting shaft as short as possible. The adaptor has a housing 26 with an internal circular bore 27 in which is mounted a torque transmitting transducer assembly 60 rotatable within the housing 26 about central axis A-A. Details of support and mounting are shown in Fig. 3

The assembly 60 has a shaft portion 62 disposed between an input portion 64 and an output portion 66 providing the output end 28 of Fig. 1. The input and output roles are reversible but the shaft portions 62 and 64 are shaped in accord with usual power tool practice. The input portion 64 is engaged with to the shaft 12 of tool 10. It is of larger diameter than the shaft portion 62 and includes an axial blind bore 68 configured to fit on the distal end 12a of the tool output shaft 12. For example, if the tool output shaft is of a square cross-section, the bore 68 is of a matching square section. The output portion 66 is shown in this embodiment as a square cross-section shaft similar to the output shaft 12 of the power tool and to which a passive load-engaging adaptor can be fitted. It will be understood that the input and output portions of the assembly 60 can be configured as required by the tool and the load adaptor respectively; or the output portion 66 could be configured for direct engagement with the load.

The shaft portion 62 is of circular cross-section and is radially-spaced from the adjacent inner surface of housing 26. Shaft portion 62 is magnetised at 70 to provide a torque-sensitive transducer element or region which emanates a torque-dependent magnetic field which is sensed by a sensor arrangement 72.

The region 70 is a region of stored magnetisation. That is, it is permanently magnetised to store a permanent magnetisation. Preferably the magnetisation is an annulus of longitudinal magnetisation about axis A-A. Longitudinal magnetisation is in the direction of axis A-A. The longitudinal

magnetisation may be of the kind known as circumferential sensing as disclosed in WO01/13081 or, preferably, of the kind known as profile-shift (axial or radial sensing) as disclosed in WO01/79801. Another torque measuring technique which does not require a region of stored magnetisation is that disclosed in British patent application GB 0204213.3 filed 22nd February, 2002. In this technique the transducer element is not a previously magnetised or (encoded) region of the shaft but is a defined region in which the torque-sensitive element is established in use.

The magnetic field sensor arrangement is disposed in the space between the portion 62 and the adjacent interior surface 27 of housing 26. As will become more apparent from the adaptor of Fig. 3, the space preferably houses a ring of material in which the sensor arrangement is embedded and a portion of which provides a bearing supporting shaft portion 62. Various magnetic field sensor devices are known in the art, e.g. Hall effect and magnetoresistive, but a preferred sensor device is a saturating-core inductor device, particularly a saturating-core device or devices connected in a signal conditioning and processing circuit (SCSP) of the kind described in WO98/52063. The complete sensor circuit arrangement is mounted to housing 26 within bore 27. The signal output cable 22 (Fig. 1) exists through the aperture 11. The sensor device(s) and the associated SCSP are not in contact with the shaft.

By way of example, Fig. 2 illustrates the SCSP 72 as including two saturating core sensor devices (MFS) 74a, 74b. As is described in WO01/13081 and WO01/79801, two devices connected in series in an SCSP circuit can be employed to additively combine torque-dependent components of the field emanated by region 70 while cancelling out a common component such as the Earth's magnetic field or an interfering component associated with power tool at the workplace to which torque is applied. The placement and

orientation of the sensor inductors is dependent on the torque-dependent component to be sensed.

The signal outputted on cable 22 is a train of pulses corresponding to the successive impacts in the power tool or other apparatus generating pulses of torque. Each pulse of the output train has an amplitude and duration representing the torque attained and the time over which the torque acts to turn or attempt to turn the load. The train of torque-representing pulses are processed by the programmed microprocessor in unit 30 to determine at which point a pre-set torque is reached. The pre-set value is input by keypad 36. Proposals for determination of the torque achieved are discussed in U.S. 2002/002050538 A1 and WO01/44776. More detailed information on the generation of torque over a successive number of pulses and its measurement is disclosed in PCT/EP02/06980.

On attaining a desired measured torque the microprocessor in unit 30 outputs a signal on cable 32 to actuate an air-valve controller 40 to shut-off the air or other power supply to the power torque tool 10.

In an alternative arrangement the SCSP circuit is included in unit 30 so that only the MFS devices are included within the adaptor and connected into the SCSP through the cable 22.

In implementing torque measurement using the adaptor described it has been found beneficial to make a measurement for each torque pulse signal which is referenced to the quiescent level of the signal output from SCSP 72. This enables drift in the output of the SCSP to be disregarded. Fig. 4 shows the output voltage V_T of the SCSP over a number of pulses at which the quiescent level V_0 drifts (the drift is exaggerated). The pulse amplitude V_P should be measured with respect to the quiescent level. Pulse detection and measurement is preferably done using a sampling technique enabling up to, say, 20 samples to be taken during the period of a pulse.

Investigation to date has revealed that the external active adaptor now proposed is likely to be more subject to interfering magnetic fields originating outside the power tool than a power tool in which magnetic-based torque measurement is made internally. On the other hand, measurement drifts and variations due to part tolerances are likely to be better in the external adaptor than with a magnetic-based torque transducer within the power tool.

It is recognised that the active torque sensor device may have a limited life expectancy. It is used in a hostile environment. In addition to the inherently vibratory nature of a power pulse torque tool, additional mechanical stresses arise in the way the tool is applied to fasten a wheel nut. The angle of the tool to the next axis varies, the stiffness of the nut on the engaged thread is another variable and the power tool may run at a very high speed if operated under no-load conditions. One additional feature that can be provided in the unit 30 is to count the number of torque pulses detected and processed as a measure of the use of the adaptor. An indicator can be displayed on the display screen 34 when a predetermined number of pulses have been recorded.

Turning now to Fig. 3, the torque sensor adaptor 120 performs and operates in the same manner as that of Fig. 2 and those details of the sensor assembly will not be repeated. Fig. 3 shows additional details of one embodiment of the mechanical structure of the active adaptor. Features like or similar to those of Fig. 2 bear the same reference numerals increased by 100.

In Fig. 3, the rotatable transducer shaft assembly 160 comprises an input portion 164, a transducer region 162 (the stored magnetisation is not illustrated), and an output portion 126. The assembly is rotatably mounted in housing 128. The output portion of square cross section includes recess 165 for co-operating with a standard passive adaptor. The transducer region 162

is located for rotation within the housing by a plain bearing provided by an annular bush 180 of a plastics material which is bonded to or otherwise secured against rotation to a forward (i.e. toward the output end) inside surface 127a of the housing 126. The interior diameter of bush 180 is slightly greater than the diameter of region 162, other than for a forward lip 182 which bears against the shaft. The bush 180 has the sensor devices 174a, 174b embedded within it. In the construction of Fig. 3 it is assumed that the SCSP circuit is external to the adaptor in the unit 30 of Fig. 1. The cable exit hole is not shown.

The rearward end of bush 180 seats against an internal step 127b of housing 126 and also provides an abutment 184 for axially locating the transducer assembly and specifically a forward surface of the enlarged input portion 164. The input portion is sized to rotate freely within a part 126a of the housing of reduced internal diameter extending from step 127b to a rearward internal step 127c. Step 127c lies adjacent a circumferential groove 165 in the input portion 164. An annular bushing 186 of a low friction, self-lubricating material is received in the groove and engages the interior surface of housing 126 and is axially located by step 127c. The bushing 186, and therewith the transducer assembly 160 is retained in the housing by an internally-located press-fit retaining ring 188 at the rear of the housing. The housing 126 not only provides mechanical support and protection but provides a magnetic shield for the transducer assembly. It will be understood that the construction illustrated in Fig. 3 is diagrammatic in nature.

One feature of the assembly 160 of Fig. 3 which differs from that of assembly 60 of Fig. 2 is that the input portion 164 terminates at 164a flush with the rearward end 126b of the housing 126 or within the axial confines of the housing which is in accord with the desire to keep the overall length of the active adaptor as small as possible. The square-section bore 168 for

engaging the output shaft of the power tool is contained within the housing. The assembly 160 is a push fit into the housing 126 from its rearward end.

To perform the function generally indicated at 24 in Fig. 1 of preventing rotation of the adaptor housing and to retain the output shaft of the power tool engaged within the bore 168, the exterior of housing 126 is adapted to retain one end of a stiff helical spring (or more than one such spring) the other end of which is retained on the housing of the power tool. The spring, thus retained, is in an axially stretched state (in tension) so that the tension maintains the active adaptor engaged with the power tool. It has also been found that the flexibility of the retaining spring enables the power tool fitted with the active adaptor to accommodate the variations in the angle between the torque axis and the load being fastened that occur in practical use of the tool. It will be understood the plain bearing type of rotary support provided by bush 180 and bushing 186 could be substituted by other means of bearing support.

If a cable 22 is used the cable can be secured to the power tool body. The unit 30 can be mounted anywhere convenient, e.g. on the airline 14 or the valve unit 40. There is advantage in using a wire-less link (free of wire connection) from the active adaptor.

The operation of the kit described requires electrical power to be available to operate the SCSP in the adaptor 20 and the electronics in unit 30. While such power can be derived from any source, it is preferred to make the kit fittable to any power torque tool without any special electrical power connection requiring to be made other than for the air valve control unit 40 which becomes part of the energy supply (air or otherwise) for the tool.

To this end the unit 30 may be battery powered and power to the SCSP in adaptor 20 supplied through the cable 22. To at least support the internal battery supply, it is now proposed to provide a means for electrical

power generation which draws its energy from the mechanical vibration of the power torque tool. Such a source would be of particular benefit where the active adaptor 20, 120 does not use any form of cable communication to unit 30. Both from the point of view of compactness and of reliability of operation in an environment of high vibration, avoidance of a battery supply at the adaptor is desirable.

DESCRIPTION OF ELECTRICAL POWER GENERATOR

A vibration-to-electrical power generator will now be described with reference to Figs. 5 and 5a.

Fig. 5 shows a generator 110 in which a magnet 112 is disposed to be freely movable along the axis of a helical coil 114 shown as a two-layer winding. The coil may be pile wound in any fashion. The axial movement of the magnet 112 and the magnet flux field associated with it generates an electromotive force (e.m.f.) in the coil as the field lines cut the coil to transform the kinetic mechanical energy of the magnet into electrical energy.

The movement of the magnet is constrained by disposing it within a cylindrical tube 116 around which the coil 114 is wound and the extent of movement is limited by stops. The magnet vibrates axially within the tube in sympathy with the vibration of a mechanical device, such as a power tool to which the tube 116 is mounted. To enhance the to-and-fro vibration of the magnet 112, at least one of the tube ends is closed by a resilient stop device, such as a spring, against which the magnet bounces or recoils when it strikes the device. Preferably each end of the tube is closed in similar manner as indicated by resilient devices 118a and 118b. The tube is of a "slippery" plastics to provide low friction for the axial vibration of the magnet. Polytetrafluoroethylene (PTFE) is an example.

The magnet 112 is a bar-type of permanent magnet and preferably of relatively high length (L) to diameter or width ratio to reduce its self-demagnetisation. The coil is of about the same length L as the magnet and the resilient devices 118a and 118b are spaced at a distance D from the
5 respective nearer end of the coil to allow the magnet to fully emerge from the coil. D is preferably at least 50% of L.

The springs or other resilient devices 118a and 118b not only serve to retain the magnet 112 in the tube 116 but also to cushion the magnet against violent shock. Furthermore, the assembly may be designed to have a
10 resonance at a frequency of the vibrating source so as to enhance the transfer of vibration of the source into vibrations of the magnet.

The vibration of the magnet 112 within coil 114 generates voltages of both polarities at a given end of the coil with respect to the other. As shown in Fig. 5a the coil 114 may be connected into a full-wave rectifier bridge 120 to
15 generate a single polarity of voltage/current output used, for example, to charge a smoothing/storage capacitor C.

The physical size of the generator of Fig. 5 is presently contemplated as ranging from a magnet which is a piece of magnetised wire disposed within a tube the size of a drinking straw – certain of the many such straws are of a
20 sufficiently "slippery" material – to a magnet fitting a tube of 1 cm diameter or more.

The generator embodiment of Fig. 5 utilizes a straight tube. The embodiment could be realised in an arcuate or other curved form. Other forms of reciprocal movement along a predetermined path between
25 prescribed limits include a magnet constrained to move in an arcuate path about an axis.

As already stated the signal communication from the adaptor 20 to the processing unit could be done by a wire-less method, such as an IR link, rather than through the cable 22. As described the cable 22 allows power to be distributed from the unit 30 to adaptor 22 or vice versa or a combination of the two. To avoid use of the cable altogether requires the adaptor 20 and unit 30 to have separate sources of power in which case the generator of Fig. 5 may be sufficient to fully power adaptor 20.

Claims

1. A torque transducer assembly comprising:

a housing having an opening therethrough;

a torque transmission shaft extending in said opening and rotatable
5 about an axis extending through said opening, said shaft having
respective end portions accessible from exteriorly of said housing,

a torque transducer element integral with, or carried by, said shaft to
emanate a magnetic field dependent on the torque in the shaft,

a magnetic field sensor arrangement located within said housing
10 adjacent said element for sensing the torque-dependent field, said
sensor arrangement being operable to provide a torque-dependent
signal; and

means for communicating said torque-dependent signal to a signal
externally of the assembly.
- 15 2. A torque transducer assembly as claimed in Claim 1 in which one end
portion of said shaft projects exteriorly of said housing and provides an output
portion of the shaft.
3. A torque transducer assembly as claimed in Claim 1 or 2 in which said
housing is configured to enable it to be secured against rotation.
- 20 4. A torque transducer assembly as claimed in Claim 3 further comprising
a member having a first portion engaged with the housing and second portion
engageable with the body of a power torque tool to secure the housing
against rotation with respect to said body.

5. A torque transducer assembly as claimed in Claim 4 in which said member comprises a helical spring.
6. A torque transducer assembly as claimed in any one of Claims 1 to 5 in which said magnetic field sensor arrangement comprises at least one magnetic field sensor device.
7. A torque transducer assembly as claimed in Claim 6 in which said magnetic field sensor arrangement further comprises a circuit into which the magnetic field sensor device(s) is connected, the circuit and magnetic field sensor device(s) being supported by said housing, the circuit being operable to output signals representing torque through the means for communicating.
8. A torque transducer comprising a torque transducer assembly which is as claimed in any one of Claims 1 to 7 and a signal processing unit in communication with said torque transducer assembly for processing said torque-dependent signals, wherein said signal processing unit is operable to process pulse signals representing pulses of torque and is responsive to the amplitude of each pulse signal with reference to the quiescent signal level on which it is imposed.
9. A torque transducer as claimed in Claim 7 or 8 wherein the means for communication utilizes a wire-less (free of wire connection) form of communication.
10. A torque transducer comprising a torque transducer assembly which is as claimed in Claim 8 and a signal processing unit connected to said means for communication by an electrical cable, said signal processing unit comprising a circuit into which the magnetic field sensor device(s) is connected through the cable, the circuit being operable to output signals representing sensed torque.

11. A transducer as claimed in Claim 10 in which signal processing unit is operable to process pulse signals representing pulses of torque and is responsive to the amplitude of each pulse signal with reference to the quiescent level on which it is imposed.
- 5 12. An electrical power generator comprising a permanent magnet disposed to move freely back-and-forth along a predetermined path between prescribed limits, a coil winding through which the predetermined path extends, the magnet and coil being so arranged that back-and-forth movements of the magnet with respect to the coil generates e.m.f.s in the coil,
10 and a rectifier arrangement for deriving voltage of a given polarity from the e.m.f.s.
13. An electrical power generator as claimed in Claim 12 in which at least one of said prescribed limits is defined by a resilient stop device from which the permanent magnet impinging thereon rebounds.
- 15 14. An electrical power generator as claimed in Claim 12 or 13 in which said coil is wound about a portion of said predetermined path, said magnet has N-S poles aligned on said path and said prescribed limits are spaced from respective ends of said path portion.
- 20 15. An electrical power generator as claimed in Claim 12 wherein the spacing between the prescribed limits and respective ends of said path portion is not less than half the length of the magnet.
16. An electrical power generator as claimed in Claim 14 or 15 in which said coil has a length along said predetermined path about equal to the length of the magnet.
- 25 17. An electrical power generator as claimed in any one of Claims 12 to 16 in which said predetermined path is straight.

18. An electrical power generator as claimed in any one of Claims 12 to 17 further comprising a tube in which the predetermined path extends, the magnet being disposed within the tube and the coil being wound about a portion of the tube.
- 5 19. An electrical power generator as claimed in Claim 18 and 13 in which the or each resilient stop device is located within the tube.
20. An electrical power generator as claimed in any one of Claims 12 to 19 in which said rectifier arrangement comprises a full-wave rectifier connected across said coil.
- 10 21. A pulsed-type power torque tool to which an electrical power generator as claimed in any one of Claims 12 to 20 is mounted whereby the magnet is reciprocated back-and-forth along said predetermined path with respect to the coil by the vibration of the power torque tool when in operation.
22. A torque transducer assembly comprising
- 15 a housing having an opening therethrough,
- a torque transmission shaft disposed in said housing for rotation about an axis extending through said opening, said shaft having a first portion supported in an annular bush secured to the housing and from which first portion and output portion of the shaft projects,
- 20 said first portion having a torque transducer element integral therewith, or carried thereby, to emanate a magnetic field dependent on the torque in the shaft, a magnetic field sensor arrangement embedded in said bush adjacent said element for providing a torque-dependent signal,
- said shaft having a second portion distal said output portion and at
- 25 least partially contained within said opening,

said second portion being of larger cross-section than said first portion and abutting said bush,

first means for locating said second portion to rotate with respect to said housing and second means for applying axial force between the housing
5 and said second portion to maintain same in abutment.

23. A torque transducer assembly as claimed in Claim 22 in which said first means comprises a bushing located in a circumferential groove around said second portion and engaging an inner surface of said opening.

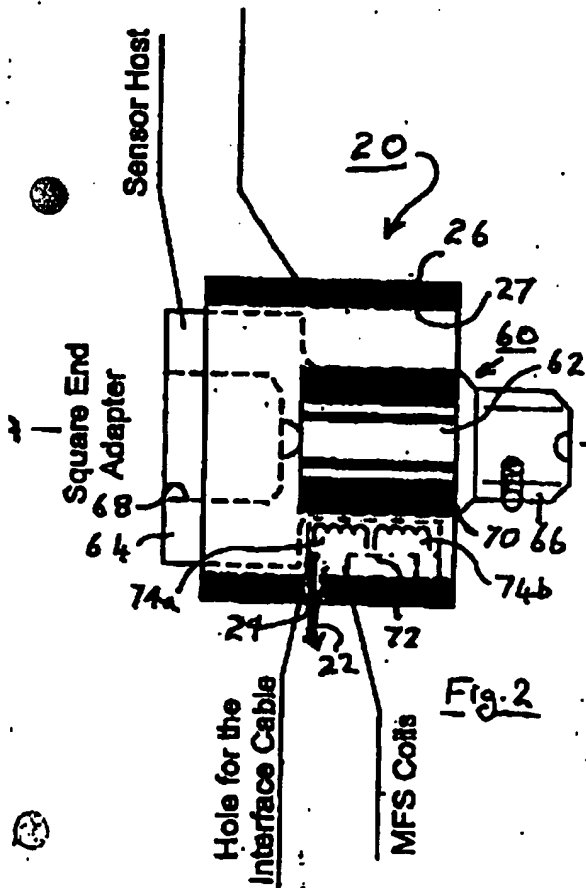
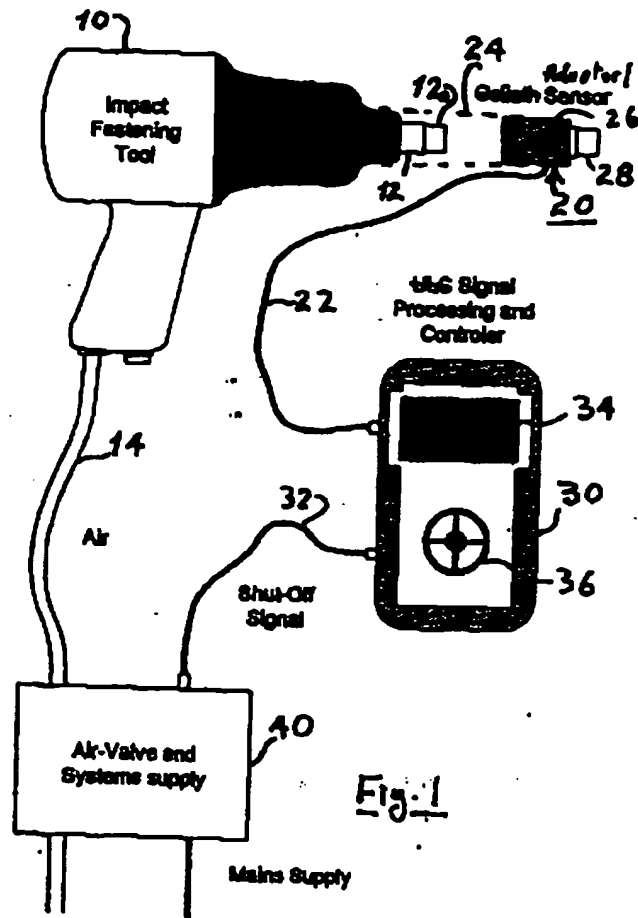
24. A torque transducer as claimed in Claim 23 in which said second
10 means comprises a retainer ring secured in said opening to apply an axial force to said bushing.

Abstract

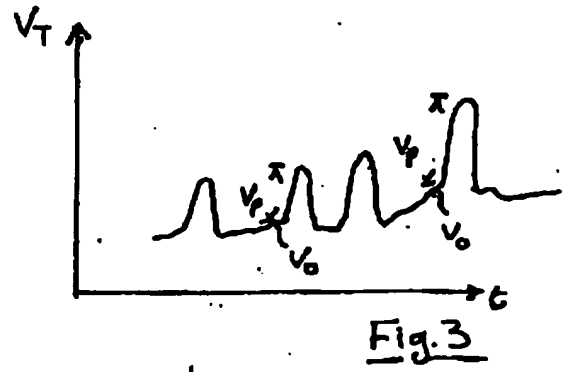
The invention relates to a torque transducer assembly and to a torque transducer incorporating such an assembly. The invention has particular application to measuring
5 torque in a fastening tool in which torque is generated in pulses and to measuring torque in an adaptor mountable to a pulsed-torque type of fastening tool.

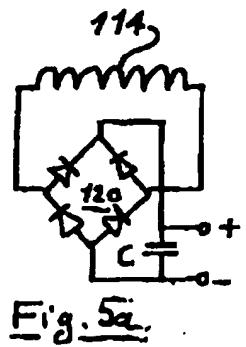
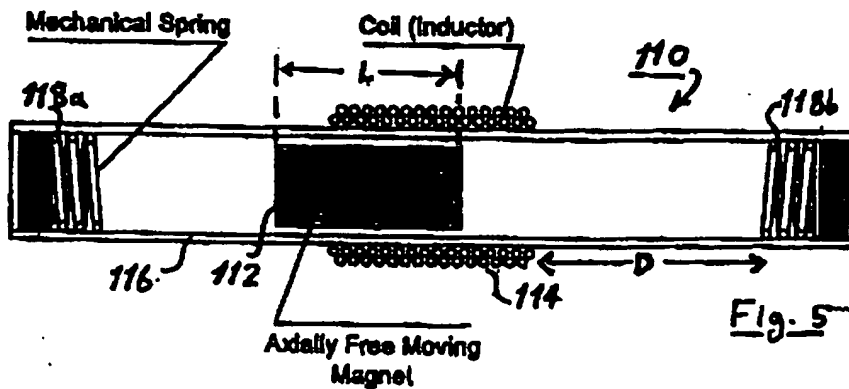
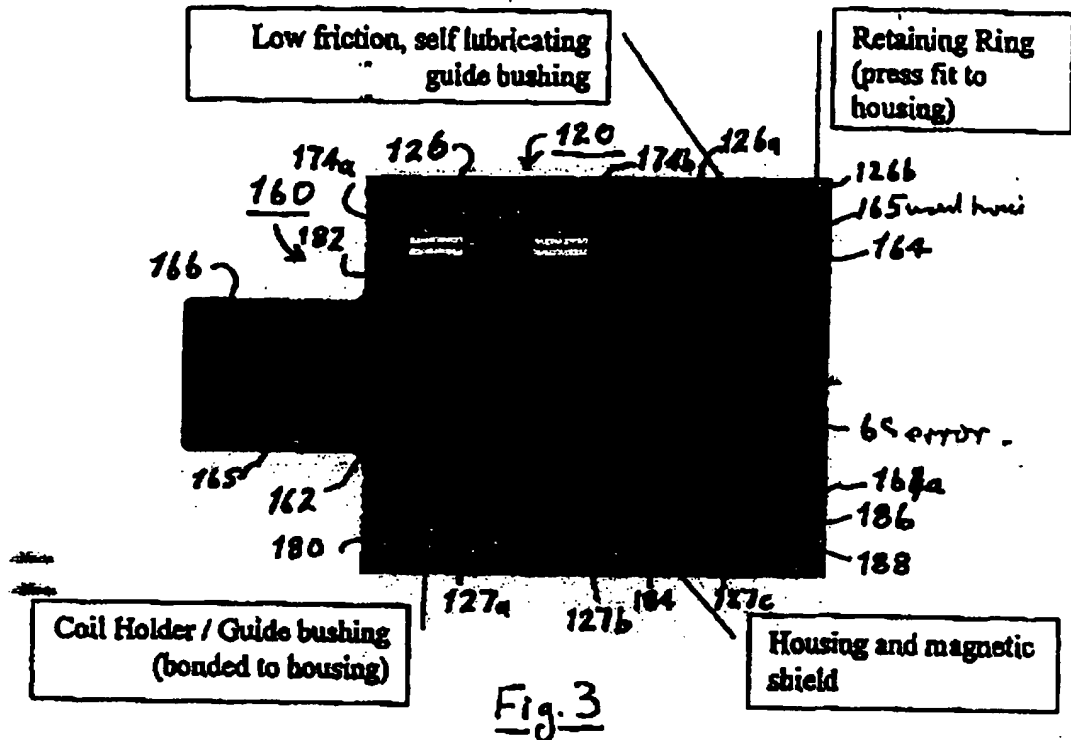
10

1/2



Drawing: Cross-section of the Galvanic torque sensor





IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of)	
)	
David KELLY et al.)	Group Art Unit: TBD
)	
Serial No. TBD)	Confirmation No. TBD
)	
Filed: February 23, 2005)	Examiner: TBD
)	
For: TORQUE SENSOR ADAPTOR)	Atty. Dkt. No.: 119508-00281

PRELIMINARY AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

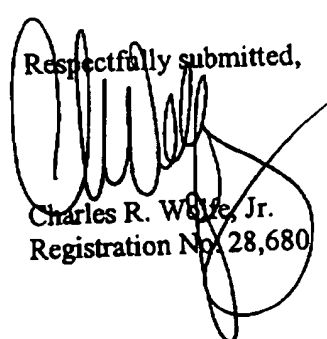
Sir:

Kindly enter this Preliminary Amendment in the record prior to examination of the claims on the merits. This paper includes the following sections:

- (1) A listing of the claims, which begins on page 2 of this paper; and
- (2) Remarks, which begin on page 7 of this paper.

Any fees due in connection with the submission of this paper and not provided in a separate check are authorized to be charged to BLANK ROME LLP, Deposit Account No. 23-2185 (reference 119508-00281).

Respectfully submitted,


Charles R. Wolfe, Jr.
Registration No. 28,680

BLANK ROME LLP
600 New Hampshire Ave., N.W.
Washington, DC 20037
Telephone: 202-772-5800
Date: February 23, 2005

AMENDMENTS TO CLAIMS

Listing of Claims:

Claim 1 (Currently Amended): A torque transducer assembly comprising:

- a housing having an opening therethrough;
- a torque transmission shaft extending in said opening and rotatable about an axis extending through said opening, said shaft having respective end portions accessible from exteriorly of said housing[,];
- a torque transducer element integral with, or carried by, said shaft to emanate a magnetic field dependent on the torque in the shaft[,];
- a magnetic field sensor arrangement located within said housing adjacent said element for sensing the torque-dependent field, said sensor arrangement being operable to provide a torque-dependent signal; and
- means for communicating said torque-dependent signal to a signal externally of the assembly.

Claim 2 (Original): A torque transducer assembly as claimed in Claim 1 in which one end portion of said shaft projects exteriorly of said housing and provides an output portion of the shaft.

Claim 3 (Currently Amended): A torque transducer assembly as claimed in Claim 1 or 2 in which said housing is configured to enable it to be secured against rotation.

Claim 4 (Currently Amended): A torque transducer assembly as claimed in Claim 3 further comprising a member having a first portion engaged with the housing and a second portion engageable with the body of a power torque tool to secure the housing against rotation with respect to said body.

Claim 5 (Original): A torque transducer assembly as claimed in Claim 4 in which said member comprises a helical spring.

Claim 6 (Currently Amended): A torque transducer assembly as claimed in ~~any one of Claims 1 to 5~~ claim 1 in which said magnetic field sensor arrangement comprises at least one magnetic field sensor device.

Claim 7 (Currently Amended): A torque transducer assembly as claimed in Claim 6 in which said magnetic field sensor arrangement further comprises a circuit into which the at least one magnetic field sensor device is connected, the circuit and the at least one magnetic field sensor device being supported by said housing, the circuit being operable to output signals representing torque through the means for communicating.

Claim 8 (Currently Amended): A torque transducer comprising a torque transducer assembly which as claimed in ~~any one of Claims 1 to 7~~ claim 1 further comprising a signal processing unit in communication with said torque transducer assembly for processing said torque-dependent signals, wherein said signal processing unit is operable to process pulse signals representing pulses of torque and is responsive to the amplitude of each pulse signal with reference to the quiescent signal level on which it is imposed.

Claim 9 (Currently Amended): A torque transducer as claimed in ~~Claim 7 or 8~~ claim 7 wherein the means for communication utilizes a wire-less (free of wire connection) form of communication.

Claim 10 (Currently Amended): A torque transducer comprising a torque transducer assembly ~~which is~~ as claimed in Claim 8 further comprising a signal processing unit connected to said means for communication by an electrical cable, said signal processing unit comprising a circuit into which the magnetic field sensor is connected through the cable, the circuit being operable to output signals representing sensed torque.

Claim 11 (Currently Amended): A transducer as claimed in Claim 10 in which the signal processing unit is operable to process pulse signals representing pulses of torque and is responsive to the amplitude of each pulse signal with reference to the quiescent level on which it is imposed.

Claim 12 (Currently Amended): An electrical power generator comprising a permanent magnet disposed to move freely back-and-forth along a predetermined path between prescribed limits, a coil winding through which the predetermined path extends, the magnet and coil being so arranged that back-and-forth movements of the magnet with respect to the coil generates e.m.f.s electromagnetic frequencies in the coil, and a rectifier arrangement for deriving voltage of a given polarity from the e.m.f.s electromagnetic frequencies.

Claim 13 (Original): An electrical power generator as claimed in Claim 12 in which at least one of said prescribed limits is defined by a resilient stop device from which the permanent magnet impinging thereon rebounds.

Claim 14 (Currently Amended): An electrical power generator as claimed in Claim 12 ~~or 13~~ in which said coil is wound about a portion of said predetermined path, said magnet having north-south poles aligned on said path and said prescribed limits are spaced from respective ends of said path portion.

Claim 15 (Original): An electrical power generator as claimed in Claim 12 wherein the spacing between the prescribed limits and respective ends of said path portion is not less than half the length of the magnet.

Claim 16 (Currently Amended): An electrical power generator as claimed in Claim 14 ~~or 15~~ in which said coil has a length along said predetermined path about equal to the length of the magnet.

Claim 17 (Currently Amended): An electrical power generator as claimed in ~~any one of Claims 12 to 16~~ claim 12 in which said predetermined path is straight.

Claim 18 (Currently Amended): An electrical power generator as claimed in ~~any one of Claims 12 to 17~~ claim 12 further comprising a tube in which the predetermined path

extends, the magnet being disposed within the tube and the coil being wound about a portion of the tube.

Claim 19 (Currently Amended): An electrical power generator as claimed in Claim 18 ~~and 13~~ in which at least one of said prescribed limits is defined by a resilient stop device from which the permanent magnet impinging thereon rebounds and in which the ~~or each~~ resilient stop device is located within the tube.

Claim 20 (Currently Amended): An electrical power generator as claimed in ~~any one of Claims 12 to 19~~ claim 12 in which said rectifier arrangement comprises a full-wave rectifier connected across said coil.

Claim 21 (Currently Amended): A pulsed-type power torque tool to which an electrical power generator ~~as claimed in any one of Claims 12 to 20~~ is mounted, the electrical power generator comprising a permanent magnet disposed to move freely back-and-forth along a predetermined path between prescribed limits, a coil winding through which the predetermined path extends, the magnet and coil being so arranged that back-and-forth movements of the magnet with respect to the coil generates electromagnetic frequencies in the coil, and a rectifier arrangement for deriving voltage of a given polarity from the electromagnetic frequencies, whereby the magnet is reciprocated back-and-forth along said predetermined path with respect to the coil by the vibration of the power torque tool when in operation.

Claim 22 (Currently Amended) A torque transducer assembly comprising:

a housing having an opening therethrough[,];

a torque transmission shaft disposed in said housing for rotation about an axis extending through said opening, said shaft having a first portion supported in an annular bush secured to the housing and from which first portion and output portion of the shaft projects,

said first portion having a torque transducer element integral therewith, or carried thereby, to emanate a magnetic field dependent on the torque in the shaft, a magnetic field sensor arrangement embedded in said bush adjacent said element for providing a torque-dependent signal,

said shaft having a second portion distal said output portion and at least partially contained within said opening,

said second portion being of larger cross-section than said first portion and abutting said bush[.];

first means for locating said second portion to rotate with respect to said housing; and

second means for applying axial force between the housing and said second portion to maintain same in abutment.

Claim 23 (Original): A torque transducer assembly as claimed in Claim 22 in which said first means comprises a bushing located in a circumferential groove around said second portion and engaging an inner surface of said opening.

Claim 24 (Original): A torque transducer as claimed in Claim 23 in which said second means comprises a retainer ring secured in said opening to apply an axial force to said bushing.

REMARKS

This Preliminary Amendment is being filed in conjunction with a national stage patent application stemming from an international application. The claims submitted herewith have been amended to remove the multiple dependencies that were present in the claims of the international application, as well as to conform to PTO patent practice rules as necessary. No new matter has been introduced.

Examination of the as-amended claims is respectfully requested.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: David Kelly et al.
Serial No: Not yet assigned
Filed: February 23, 2005
For: TORQUE SENSOR ADAPTOR

GAU: Unassigned
Confirmation No. Unknown
Examiner: Unknown

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR 1.97

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The undersigned wishes to disclose the following information.

REFERENCES

- ☒ The undersigned wishes to make of record the references listed on the attached form PTO-1449. Copies of the listed references are attached, where required, as are either statements of relevancy or any readily available English translations of pertinent portions of any non-English language references.
- ☐ A check is attached in the amount required under 37 CFR §1.17(p).

RELATED CASES

- ☐ Attached is a copy of applicant's pending application(s) or issued patent(s) which may be related to the present application. These documents are listed on form PTO-1449, also attached.
- ☐ A check is attached in the amount required under 37 CFR §1.17(p).

CERTIFICATION

- ☐ Each item of information contained in this information disclosure statement was cited for the first time in any communication from a foreign patent office in any counterpart foreign application not more than three months prior to the filing of this statement.
- ☐ No item of information contained in this information disclosure statement was cited for the first time in any communication from a foreign patent office in a counterpart foreign application or, to the knowledge of the undersigned, having made reasonable inquiry, was known to any individual designated in 37 CFR §1.56(c) more than three months prior to the filing of this statement.
- ☐ This Information Disclosure Statement is being filed within three months of the filing date of the subject patent application.
- ☒ This Information Disclosure Statement is being filed before the mailing date of a first Office Action on the merits.

PETITION

- ☐ Applicant(s) hereby request consideration of the attached information. A check is attached in the amount of the Petition fee required under 37 CFR §1.17(i)(1).

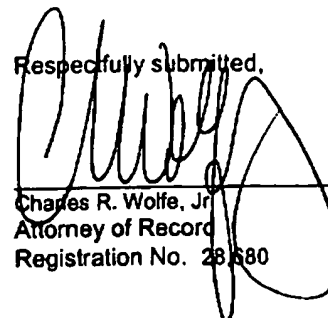
DEPOSIT ACCOUNT

- ☒ Please charge any additional fees for the papers being filed herewith and for which no check is enclosed herewith, or credit any overpayment to deposit account number 23-2185. A duplicate copy of this sheet is enclosed.

Blank Rome LLP
600 New Hampshire Avenue, N.W.
Washington, DC 20037
Tel: (202) 772-5800
Fax (202) 572-8398
Customer No.: 27557

Date: February 23, 2005

Respectfully submitted,


Charles R. Wolfe, Jr.
Attorney of Record
Registration No. 281680

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1448A/PTO

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Complete if Known

Application Number	Not yet assigned
Filing Date	February 23, 2005
First Named Inventor	David Kelly et al.
Art Unit	Unknown
Examiner Name	Unknown
Attorney Docket Number	119508-00281

Sheet

1

of

2

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (if known)			
		US 2002/0020538 A1	02-21-2002	Giardino	
		US 3,448,305	06-03-1969	J. Raynal et al.	
		US 4,918,997	04-24-1990	Pouillange	
		US 5,315,501	05-24-1994	Whitehouse	
		US 5,898,379	04-27-1999	Vanbergeijk	
		US 5,975,714	11-02-1999	Vetorino et al.	
		US 5,982,059	11-09-1999	Anderson	
		US 6,196,071 B1	03-06-2001	Shomo	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁶
		Country Code ³ Number ⁴ Kind Code ⁵ (if known)				
		EP 0 911 118 A2 and A3	04-28-1999	Atlas Copco Tools AB		
		DE 196 38 191 A1	03-26-1998	Karl H. Kessler		
		DE 102 17 416 C1				
		WO 2004/018153 A3	03-04-2004	Fast Technology AG	English Abstract	

Examiner
Signature

Date

Considered

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional) 2 See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Substitute for form 1449A/PTO

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Complete if Known

Application Number	Not yet assigned
Filing Date	February 23, 2005
First Named Inventor	David Kelly et al.
Art Unit	Unknown
Examiner Name	Unknown
Attorney Docket Number	119508-00281

Sheet 2 of 2

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
		Notification Concerning Submission or Transmittal of Priority Document, mailed Nov. 27, 2003.	
		International Search Report mailed Feb. 27, 2004.	
		International Preliminary Report on Patentability, date of completion of report Dec. 17, 2004.	

Examiner Signature	Date Considered
-----------------------	--------------------

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ Applicant's unique citation designation number (optional). ² Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

RECORDATION FORM COVER SHEET

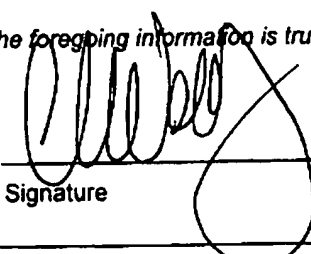
PATENTS ONLY

To the Director of the U.S. Patent and Trademark Office: Please record the attached original documents or the new address(es) below.

1. Name of conveying party(ies)/Execution Date(s) FAST Technology AG Execution Date(s): June 8, 2004 Additional name(s) of conveying party(ies) attached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	2. Name and address of receiving party(ies) Name: Abas, Incorporated Internal Address: Street Address: 7401 W. Wilson Avenue City: Chicago State: IL Zip: 60706 Country: USA Additional name(s) of conveying party(ies) attached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
3. Nature of conveyance: <input checked="" type="checkbox"/> Assignment <input type="checkbox"/> Merger <input type="checkbox"/> Security Agreement <input type="checkbox"/> Change of Name <input type="checkbox"/> Government Interest Assignment <input type="checkbox"/> Executive Order 9424, Confirmatory License <input type="checkbox"/> Other	4. Application number(s) or patent number(s): <input type="checkbox"/> This document is being filed together with a new application A. Patent Application No.(s) Not yet received Title(s): TORQUE SENSOR ADAPTOR B. Patent No.(s) Title(s): Additional numbers attached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
5. Name and address to whom correspondence concerning document should be mailed: Customer No.: 27557 Blank Rome LLP 600 New Hampshire Avenue, N.W. Washington, D.C. 20037 Phone: 202-772-5800 Fax: 202-572-8398 Attorney Docket No.: 119508-00281	6. Total number of applications and patents involved: 1 7. Total fees (37 CFR 1.21(h)) \$ 40 <input type="checkbox"/> Enclosed <input type="checkbox"/> Authorized to be charged to deposit account <input type="checkbox"/> None required (government interest not affecting title) 8. Deposit account number: 23-2185 (Attach duplicate copy of this page if paying by deposit account)

DO NOT USE THIS SPACE

9. Statement and signature.
To the best of my knowledge and belief, the foregoing information is true and correct and any attached copy is a true copy of the original document.

<u>Charles R. Wolfe, Jr.</u> Name of Person Signing Registration No.: 28,680	 Signature	<u>February 23, 2005</u> Date
--	---	----------------------------------

Total number of pages including cover sheet, attachments, and documents

6

Mail documents to be recorded with required cover sheet information to:
Mail Stop Assignment Recordation Services
Commissioner for Patents
Alexandria, VA 22313-1450



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
28.04.1999 Bulletin 1999/17

(51) Int Cl.⁶ **B25B 23/14**

(21) Application number: **98850165.6**

(22) Date of filing: **22.10.1998**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE
 Designated Extension States:
AL LT LV MK RO SI

(72) Inventor: **Schoeps, Christian Knut**
13547 Tyresö (SE)

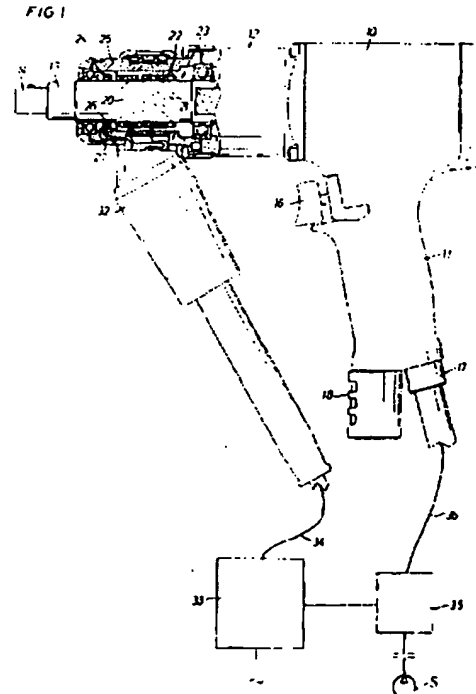
(74) Representative: **Pantzar, Tord**
Atlas Copco Tools AB
Patent Department
105 23 Stockholm (SE)

(30) Priority: **27.10.1997 SE 9703896**

(71) Applicant: **ATLAS COPCO TOOLS AB**
105 23 Stockholm (SE)

(54) **Method for determining the installed torque in a screw joint at impulse tightening and a torque impulse tool for tightening a screw joint to a predetermined torque level**

(57) A basic method for determining the installed torque in a screw joint which is being tightened by a series of repeated torque impulses, wherein the rotational movement of the screw joint is detected during each impulse, the point in which the screw joint ceases to rotate is detected, and the actually applied torque is indicated the very instance the screw joint ceases to rotate. In a tightening process control application of the above described basic method, the per impulse increasing value of the installed torque is compared to a predetermined target value in a way known per se, and the tightening process is interrupted as the target value is reached. In a tightening process quality check application of the above described basic method, the accomplished angular displacements of the joint at repeated impulses are indicated and added, and high and low limit values for the final installed torque and the total angle of rotation are provided and compared to the actually obtained values. A torque impulse delivering power tool comprising an impulse generator (12) with an output shaft (13) having a torque transducer (23) and a rotation detecting device (24) both connected to a process control unit (33) in which a device is arranged to provide a torque target value and a comparing circuit is provided to compare the actual value of the installed torque with the target value and to initiate shut-off of the power supply to the power tool as the target value is reached.



not influence the stop position of the joint.

[0024] As described above, the screw joint position at the end of the accomplished rotational increment is marked with ϕ_1 and has a corresponding location in all three diagrams 3a-c.

[0025] In the diagram shown in Fig. 3c, there are illustrated both a signal representing the torque M delivered to the screw joint and a signal representing the obtained clamping force or tension F in the joint. The clamping force F is obtained from a sensor mounted directly on the screw joint. This arrangement is used for experimental purposes only, because if you always have access to the actual clamping force in the joint during tightening the new method for obtaining a more accurate measurement of the installed torque would be meaningless. Accordingly, the clamping force sensor is used just for obtaining a diagrammatical illustration of the tension increase during each impulse, particularly when illustrated in a direct comparison with the torque/time curve.

[0026] It is to be observed that the torque curve is plotted with an increasing torque directed downwards, whereas the tension curve is shown with increasing magnitudes directed upwards. See arrows to the left of the diagram in Fig. 3c.

[0027] From the diagram in Fig. 3c it is evident that the screw joint position ϕ_1 does not coincide with the position in which the peak value M_p of the torque is detected. Instead, the diagram shows that the screw joint continues to rotate over a further angular distance after the torque peak magnitude has been detected. This means that the screw joint is subjected to a further increased clamping force, and that the obtained clamping force level corresponds to a much lower torque magnitude than what is represented by the torque peak level M_p . The torque magnitude corresponding to the stopping position of the joint is the installed torque and is designated M_i .

[0028] In Fig. 3c, there is also illustrated the growth of the clamping force F during a torque impulse delivered to the joint. In the diagram of Fig. 3, there is clearly shown that the clamping force F starts increasing as the joint starts rotating and continues to increase until the joint stops rotating, as illustrated by the point ϕ_1 .

[0029] The slight wave form of the torque/time curve, i.e. the occurrence of a second lower peak, is due to dynamic forces and elasticity in the power train of the tightening tool.

[0030] In Figs. 4a-c, 5a-c and 6a-c there are shown curves reflecting the rotational movement of the screw joint as well as the detected torque and clamping force magnitudes during three later torque pulses delivered to the joint during the same tightening process. It is clearly shown that the pulses are successively shorter as the joint is further tightened, and that the secondary torque peak tends to merge with the main torque peak as the tightening process approaches the final pretension condition. See Fig. 6c.

[0031] The four different torque pulses illustrated in Figs. 3a-c, 4a-c, 5a-c and 6a-c, respectively, show clearly by way of examples that the main torque peak value previously used for determining the tightening state of the screw joint does not represent the torque magnitude that corresponds to the obtained clamping force in the joint. Even though at a later tightening stage the rotation stop point ϕ_1 of each impulse is closer to the torque peak point, there is still a substantial difference between the peak level M_p and the installed torque M_i . See Fig. 6c.

[0032] According to the invention, the per impulse increasing installed torque M_i , which is detected at the point where the screw joint rotation ceases at each impulse, is used for determining when the joint is tightened to the predetermined torque target level.

[0033] Moreover, in the diagrams shown in Figs. 3c, 4c, 5c and 6c, there is confirmed that the actual clamping force F actually increases over the angular interval determined by the duration of each impulse. Accordingly, it can be seen that the clamping force F increases from the point ϕ_0 in which the rotation starts to the point ϕ_1 in which the rotation ceases.

Claims

1. Method for determining the installed torque in a screw joint which is being tightened by a series of repeated torque impulses, comprising the measures of detecting continuously the rotational movement of the screw joint during each impulse,

indicating when the rotational movement of the screw joint ceases at each impulse, and indicating at the very instance the rotational movement of the screw joint ceases the value of the actual torque applied on the screw joint.

2. Method for controlling a screw joint tightening process wherein the screw joint is to be tightened to a predetermined torque level by means of a torque impulse delivering tool, comprising measuring of the instantaneous value of the torque delivered to the screw joint during each one of a number of succeeding torque impulses delivered to the screw joint, and interrupting the tightening process as a predetermined target value of the applied torque is reached,

characterized by detecting continuously the rotational movement of the screw joint during each one of said torque impulses, indicating when the rotational movement of the screw joint ceases at each impulse, indicating the value of the applied torque at the very instance the rotational movement of the screw joint ceases at each impulse, comparing said indicated postrotation value of the applied torque at each one of a number of succeeding impulses with said predetermined target value, and interrupting

the tightening process as said indicated postrotation value of the applied torque has reached said target value.

3. Method for quality checking of a screw joint tightening process performed by a torque impulse delivering power tool, comprising measuring of the instantaneous torque value as well as the accomplished rotational increment accomplished during each one of a number of succeeding torque impulses, providing high and low limit values for the final torque and the total angle of rotation, comparing at the end of the tightening process the obtained final torque value and the total angle of rotation with said limit values, and providing an indication as to whether said final torque and said total angle of rotation are within said limit values or not as the process is completed, wherein said torque value is measured at the very end of the accomplished rotational increment measured during each one of the delivered torque impulses. 5 10 15 20
4. Method according to claim 3, wherein the rotational increment accomplished at the very first impulse of a series of delivered impulses is measured from a point determined by the torque passing a predetermined threshold value at the start of the impulse. 25
5. Torque impulse delivering power tool for tightening a screw joint to a predetermined torque level, comprising a rotation motor, an output shaft (13) connected to said motor, a rotational movement detecting device (24), a torque transducer (23) for generating a signal in response to the torque delivered via said output shaft (13), and a control unit (33) connected to said rotational movement detecting devices (24) and said torque transducer (23), said control unit (33) including a device for providing a desired torque target value, a comparing circuit arranged to be activated by said rotational movement detecting device (24) to compare said target value with the value of the delivered torque the very instance said rotational movement detecting device (24) indicates that the rotational movement of the screw joint ceases at each delivered impulse, and a motor power shut-off device (35) connected to said comparing circuit and arranged to interrupt the power supply to said motor as the value of the delivered torque equals said torque target value. 30 35 40 45 50
6. Power tool according to claim 5, wherein said rotational movement detecting device (24) is arranged to generate a rotation angle responsive signal, and said control unit (33) comprises a signal storing and adding device which is connected to said rotational movement detecting device (24) and arranged to store and add successively the rotation angle responsive signals corresponding to the interval of 55

angular displacement detected by said rotational movement detecting device (24) during each impulse. said control unit (33) further comprises a device for providing a target value for the total angular displacement, said signal storing and adding device is connected to said comparing circuit and to said power shut-off device (35) to initiate motor power shut-off as the sum of the stored total angular displacement signals correspond to said target value.

FIG 1

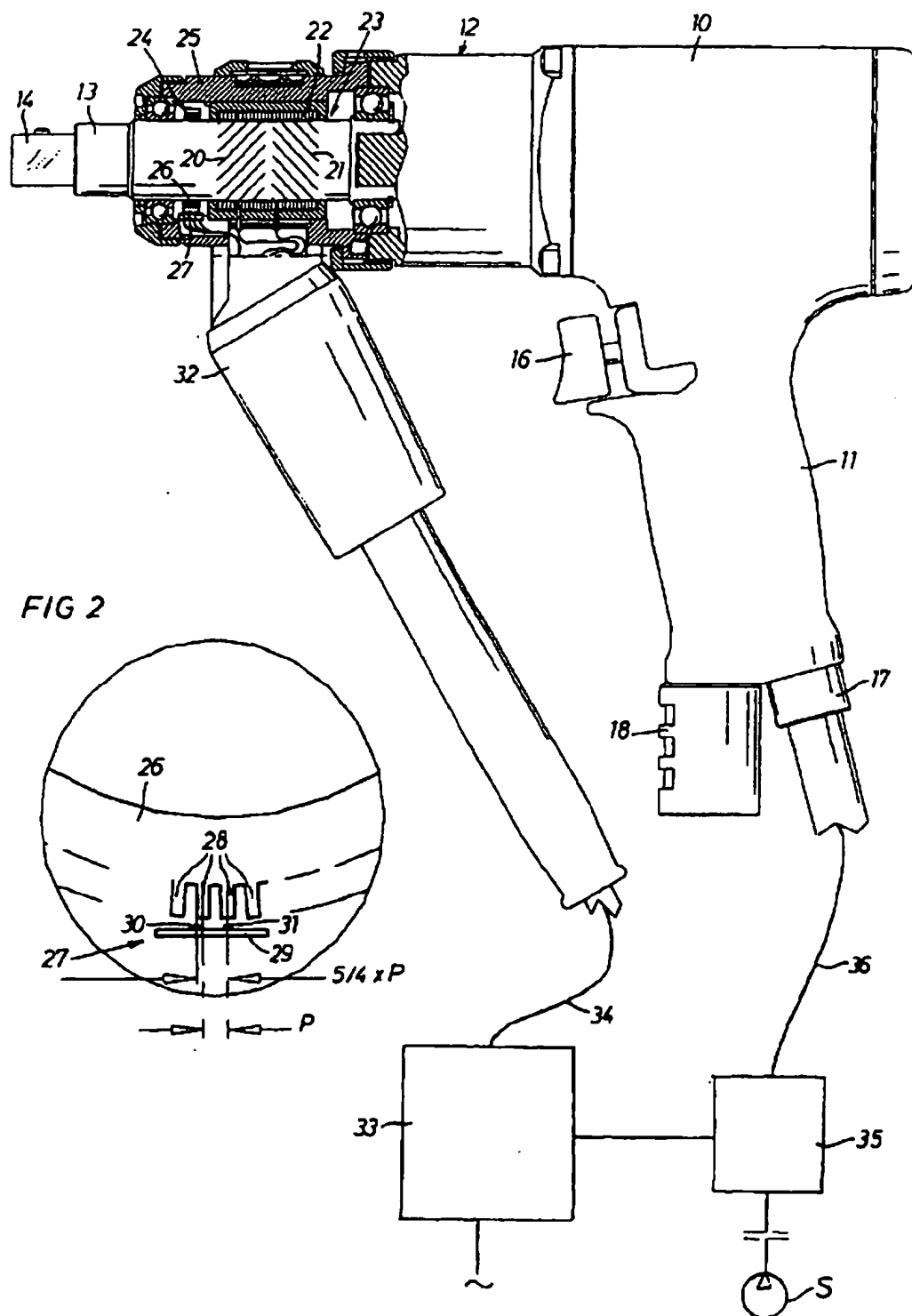


FIG 2

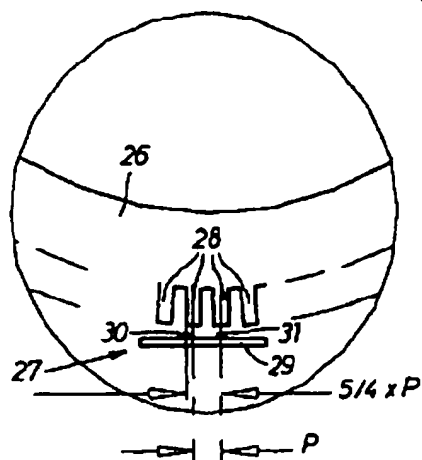


FIG 3a

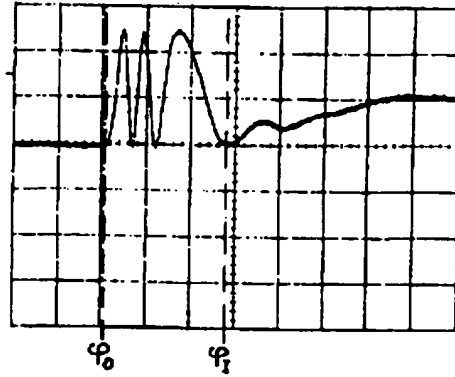


FIG 4a

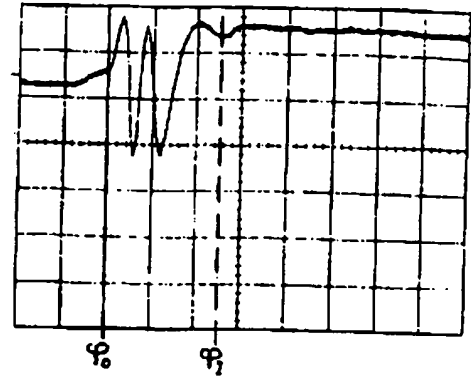


FIG 3b

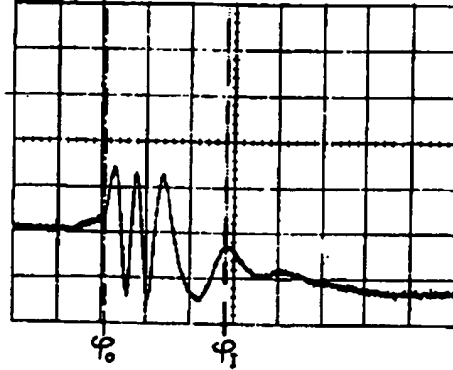


FIG 4b

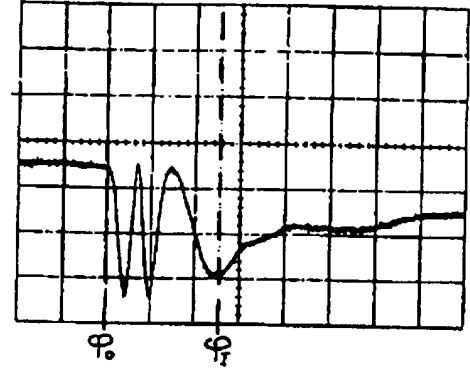


FIG 3c

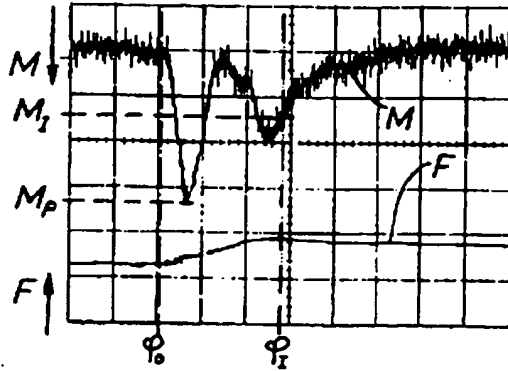


FIG 4c

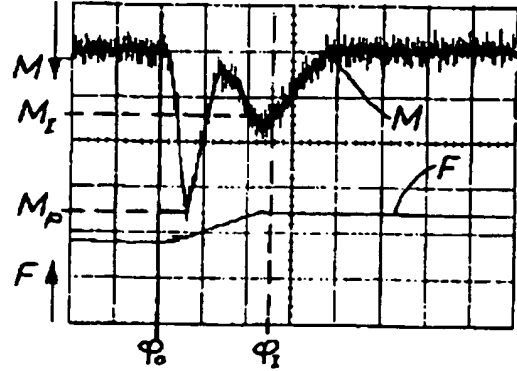


FIG 5a

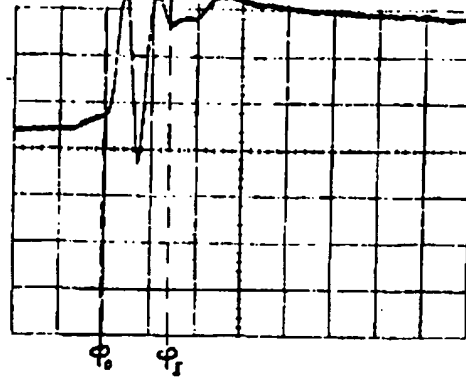


FIG 6a

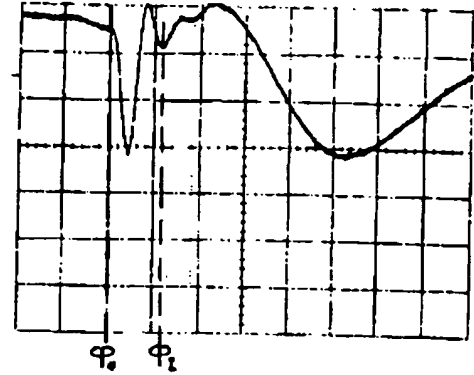


FIG 5b

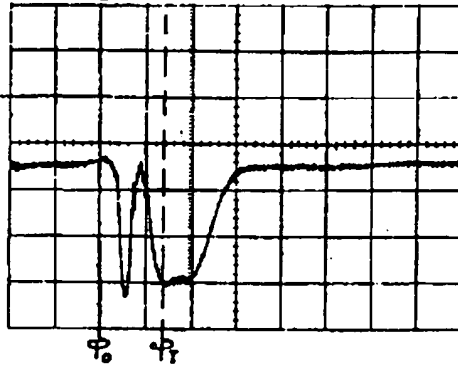


FIG 6b

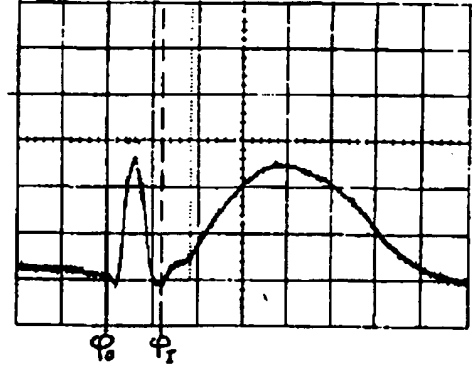


FIG 5c

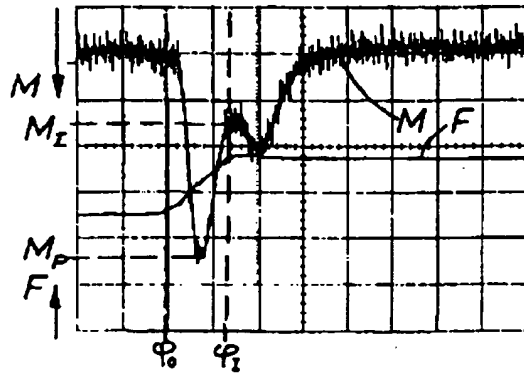
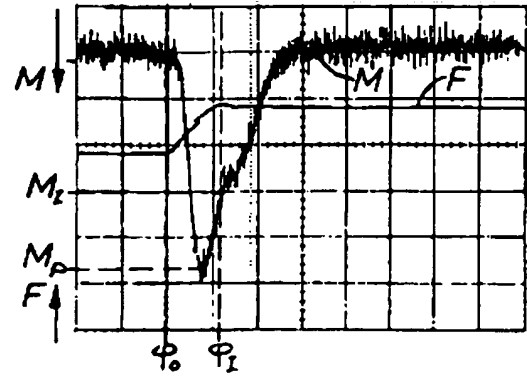


FIG 6c



(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11)

EP 0 911 119 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
29.03.2000 Bulletin 2000/13

(51) Int Cl 7: B25B 23/14

(43) Date of publication A2:
28.04.1999 Bulletin 1999/17

(21) Application number: 98850165.6

(22) Date of filing: 22.10.1998

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(72) Inventor: Schoeps, Christian Knut
13547 Tyresö (SE)

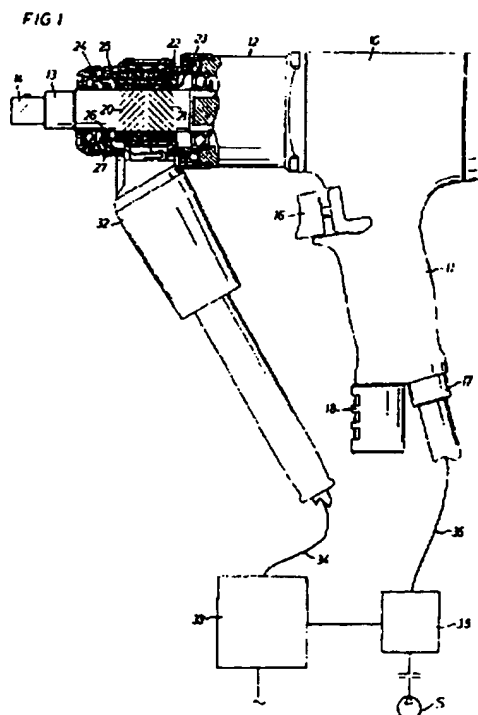
(74) Representative: Pantzar, Tord
Atlas Copco Tools AB
Patent Department
105 23 Stockholm (SE)

(30) Priority: 27.10.1997 SE 9703896

(71) Applicant: ATLAS COPCO TOOLS AB
105 23 Stockholm (SE)

(54) **Method for determining the installed torque in a screw joint at impulse tightening and a torque impulse tool for tightening a screw joint to a predetermined torque level**

(57) A basic method for determining the installed torque in a screw joint which is being tightened by a series of repeated torque impulses, wherein the rotational movement of the screw joint is detected during each impulse, the point in which the screw joint ceases to rotate is detected, and the actually applied torque is indicated the very instance the screw joint ceases to rotate. In a tightening process control application of the above described basic method, the per impulse increasing value of the installed torque is compared to a predetermined target value in a way known per se, and the tightening process is interrupted as the target value is reached. In a tightening process quality check application of the above described basic method, the accomplished angular displacements of the joint at repeated impulses are indicated and added, and high and low limit values for the final installed torque and the total angle of rotation are provided and compared to the actually obtained values. A torque impulse delivering power tool comprising an impulse generator (12) with an output shaft (13) having a torque transducer (23) and a rotation detecting device (24) both connected to a process control unit (33) in which a device is arranged to provide a torque target value and a comparing circuit is provided to compare the actual value of the installed torque with the target value and to initiate shut-off of the power supply to the power tool as the target value is reached.



EP 0 911 119 A3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 85 0165

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US 5 567 886 A (KETTNER KONRAD K) 22 October 1996 (1996-10-22) * abstract: figure 1 * * column 2, line 21 - line 30 * * column 5, line 11 - line 20 * ---	1-3,5	B25B23/14 B25B23/145 B23P19/06
A	DE 42 43 069 A (GARDNER DENVER GMBH) 23 June 1994 (1994-06-23) * claims 1,2; figure 1 * ---	1-3	
A	PATENT ABSTRACTS OF JAPAN vol. 007, no. 246 (M-253), 2 November 1983 (1983-11-02) & JP 58 132426 A (NITSUTOU SEIKOU KK), 6 August 1983 (1983-08-06) * abstract * ---	1,2,5	
A	US 4 185 701 A (BOYS JOHN T) 29 January 1980 (1980-01-29) * column 3, line 41 - line 45 * ---	4	
A	US 5 094 301 A (WIPPERMAN LLOYD H ET AL) 10 March 1992 (1992-03-10) * column 13, line 48 - line 55 * ---	6	TECHNICAL FIELDS SEARCHED (Int.Cl.6) B25B B23P
D,A	US 5 366 026 A (MARUYAMA JUNICHI ET AL) 22 November 1994 (1994-11-22) * abstract * -----	1-3,5	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 9 February 2000	Examiner Dietz, N
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 98 85 0165

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

09-02-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5567886 A	22-10-1996	DE 4429282 A	22-02-1996
		CA 2156373 A, C	19-02-1996
		DE 59503770 D	05-11-1998
		EP 0699508 A	06-03-1996
		ES 2123866 T	16-01-1999
DE 4243069 A	23-06-1994	NONE	
JP 58132426 A	06-08-1983	JP 1612028 C	30-07-1991
		JP 2032117 B	18-07-1990
US 4185701 A	29-01-1980	IT 1206548 B	27-04-1989
		US 4358735 A	09-11-1982
		AU 508624 B	27-03-1980
		AU 1408276 A	24-11-1977
		BR 7603104 A	01-02-1977
		CA 1077752 A	20-05-1980
		DE 2622053 A	02-12-1976
		ES 448079 A	16-11-1977
		ES 460310 A	01-04-1978
		ES 460311 A	01-04-1978
		ES 460312 A	16-04-1978
		ES 460313 A	01-10-1978
		ES 460314 A	01-04-1978
		FR 2333619 A	01-07-1977
		GB 1558560 A	03-01-1980
		GB 1560529 A	06-02-1980
		IT 1065878 B	25-02-1985
		JP 1078237 C	25-12-1981
		JP 51140300 A	03-12-1976
		JP 56021550 B	20-05-1981
		MX 144159 A	08-09-1981
		SE 434809 B	20-08-1984
		SE 7605623 A	20-11-1976
		SE 8007600 A	29-10-1980
		ZA 7602927 A	27-04-1977
US 5094301 A	10-03-1992	DE 4100157 A	18-07-1991
US 5366026 A	22-11-1994	JP 6091551 A	05-04-1994
		JP 2953211 B	27-09-1999
		JP 6091552 A	05-04-1994
		JP 2629532 B	09-07-1997
		JP 6079638 A	22-03-1994
		GB 2271197 A, B	06-04-1994

EPO Form P499

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

PATENT COOPERATION TREATY

PCT

NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

STRAUS, Alexander
Becker.Kurig.Straus
Bavariastrasse 7
80336 München
GermanyBECKER KURIG STRAU
BAVARIASTRASSE 7 80336 MÜNCHEN

09. Dez. 2003

WV: / LF:

Date of mailing (day/month/year) 27 November 2003 (27.11.03)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 51929EP	
International application No. PCT/EP03/09349	International filing date (day/month/year) 22 August 2003 (22.08.03)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 23 August 2002 (23.08.02)
Applicant FAST TECHNOLOGY AG et al	

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
23 Augu 2002 (23.08.02)	0219745.7	GB	26 Nove 2003 (26.11.03)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 338.89.70

Authorized officer

Peter WIMMER (Fax 338 8970)

Telephone No. (41-22) 338 9886

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
4 March 2004 (04.03.2004)

PCT

(10) International Publication Number
WO 2004/018153 A3

(51) International Patent Classification: B25B 23/14,
G01L 3/10, H02K 35/02

(21) International Application Number:
PCT/EP2003/009349

(22) International Filing Date: 22 August 2003 (22.08.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0219745.7 23 August 2002 (23.08.2002) GB

(71) Applicant (for all designated States except US): FAST
TECHNOLOGY AG [DE/DE]; Otto-Hahn-Strasse 24,
Gewerbegebiet Riemerling, 85521 Ottobrunn (DE).

(72) Inventors; and

(75) Inventors/Applicants (for US only): KELLY, David

[US/DE]; c/o Fast Technology AG, Otto-Hahn-Strasse 24,
Gewerbegebiet Riemerling, 85521 Ottobrunn (DE). MAY,
Lutz, Axel [DE/DE]; Wolfpratshäuser Strasse 23a, 82538
Gelting (DE).

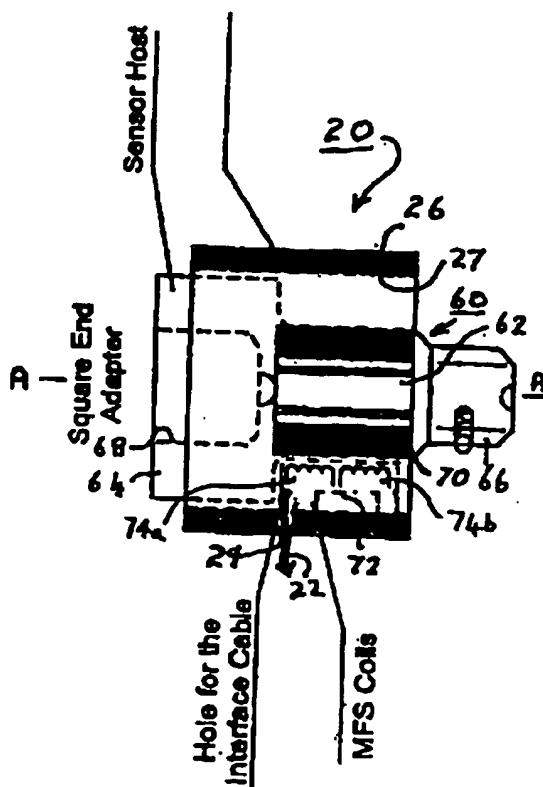
(74) Agent: STRAUS, Alexander; Becker.Kurig.Straus,
Bavariastrasse 7, 80336 München (DE).

(81) Designated States (national): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE,
SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,
VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,

[Continued on next page]

(54) Title: TORQUE SENSOR ADAPTOR



(57) Abstract: The invention relates to a torque
transducer assembly and to a torque transducer
incorporating such an assembly. The invention
has particular application to measuring torque in a
fastening tool in which torque is generated in pulses
and to measuring torque in an adaptor mountable to
a pulsed-torque type of fastening tool.

WO 2004/018153 A3



ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(88) Date of publication of the International search report:
29 April 2004

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/09349

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 B25B23/14 G01L3/10 H02K35/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B25B G01L H02K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 911 119 A (ATLAS COPCO TOOLS AB) 28 April 1999 (1999-04-28) column 3, line 3 - line 27; figure 1	1-4, 6-8, 10, 11
X	DE 196 38 191 A (KESSLER KARL H) 26 March 1998 (1998-03-26) column 1, line 13 - line 23 column 1, line 43 - line 49; claims 1, 5; figure 1	1, 2, 6, 7 8-10, 22
X	US 4 918 997 A (POUILLANGE JEAN) 24 April 1990 (1990-04-24) column 1, line 6 - line 32; figure 1	1, 2, 6, 7 8-10, 22
P, X	DE 102 17 416 C (GEILENBRUEGGE IVO) 31 July 2003 (2003-07-31) claims 1, 12; figures	1, 2, 6-9
	-/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

*** Special categories of cited documents:**

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- *8* document member of the same patent family

Date of the actual completion of the international search

18 February 2004

Date of mailing of the international search report

27 FEB 2004

Name and mailing address of the ISA
 European Patent Office, P.O. Box 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nt,
 Fac. (+31-70) 340-3018

Authorized officer

Ramos, H

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 03/09349

C-(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 196 071 B1 (SHOMO ROBERT D) 6 March 2001 (2001-03-06) column 1, line 51 - line 62 column 3, line 29 - line 42 abstract; figures	1,2,6-8, 10,22
A	US 5 315 501 A (WHITEHOUSE HUGH L) 24 May 1994 (1994-05-24) column 3, line 30 - line 33; figure 1	1,10,22
A	US 5 898 379 A (VANBERGEIJK ERNST) 27 April 1999 (1999-04-27) abstract; figure 1	8
A	US 2002/020538 A1 (GIARDINO DAVID A) 21 February 2002 (2002-02-21) cited in the application page 2, paragraph 30; figure 1	1,22
X	US 5 975 714 A (PLATT JAMES VICTOR ET AL) 2 November 1999 (1999-11-02) column 1, line 45 -column 2, line 3 column 3, line 9 -column 3, line 21 column 3, line 56 -column 3, line 65 column 4, line 39 -column 4, line 40 figures 1,2,5	12-20
A	US 3 448 305 A (RAYNAL JEAN ET AL) 3 June 1969 (1969-06-03) column 1, line 14 -column 1, line 24 figures	21
A	US 5 982 059 A (ANDERSON MARTY J) 9 November 1999 (1999-11-09) column 1, line 12 -column 1, line 15 column 2, line 26 -column 2, line 40 figure 1	21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP 03/09349

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

see additional sheet

As a result of the prior review under R. 40.2(e) PCT,
no additional fees are to be refunded.

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☒ The additional search fees were accompanied by the applicant's protest.
☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-11, 22-24

Torque transducer assembly with a housing surrounding a shaft extending therethrough, a magnetic field sensor assembly being incorporated within the housing

2. Claims: 12-21

Electrical power generator, involving a permanent magnet moving back-and-forth through a coil winding, thereby generating e.m.f.s. in the coil and a rectifier arrangement

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 03/09349

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0911119	A	28-04-1999	SE 511336 C2 DE 69806113 D1 DE 69806113 T2 EP 0911119 A2 JP 11254340 A SE 9703896 A US 6134973 A US 6341533 B1	13-09-1999 25-07-2002 23-01-2003 28-04-1999 21-09-1999 28-04-1999 24-10-2000 29-01-2002
DE 19638191	A	26-03-1998	DE 19638191 A1	26-03-1998
US 4918997	A	24-04-1990	FR 2612633 A1 AT 64008 T DE 3862984 D1 EP 0285827 A2	23-09-1988 15-06-1991 04-07-1991 12-10-1988
DE 10217416	C	31-07-2003	DE 10217416 C1 US 2003196497 A1	31-07-2003 23-10-2003
US 6196071	B1	06-03-2001	NONE	
US 5315501	A	24-05-1994	DE 4310936 A1 GB 2265728 A ,B JP 2957838 B2 JP 7164344 A	07-10-1993 06-10-1993 06-10-1999 27-06-1995
US 5898379	A	27-04-1999	NONE	
US 2002020538	A1	21-02-2002	US 6311786 B1 CA 2446758 A1 WO 02098612 A1 US 2003098167 A1 US 2003102140 A1	06-11-2001 12-12-2002 12-12-2002 29-05-2003 05-06-2003
US 5975714	A	02-11-1999	US 6220719 B1	24-04-2001
US 3448305	A	03-06-1969	NONE	
US 5982059	A	09-11-1999	US 5793130 A AU 6323798 A WO 9835160 A1	11-08-1998 26-08-1998 13-08-1998

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

Straus, Alexander
BECKER, KURIG, STRAUS
Bavariastrasse 7
D-80336 München
ALLEMAGNE

BECKER KURIG STRAUS
BAVARIASTRASSE 7 80336 MÜNCHEN

20. Dez. 2004

WV: / LF:

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(PCT Rule 71.1)

Date of mailing
(day/month/year)

17.12.2004

Applicant's or agent's file reference
51929WO

IMPORTANT NOTIFICATION

International application No.
PCT/EP 0309349

International filing date (day/month/year)
22.08.2003

Priority date (day/month/year)
23.08.2002

Applicant
FAST TECHNOLOGY AG et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized Officer

Moris, A

Tel. +49 89 2399-2973



PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 51929WO	<div style="display: flex; justify-content: space-between;"> <div> FOR FURTHER ACTION </div> <div> See Form PCT/PEA/416 </div> </div>	
International application No. PCT/EP 03/09349	International filing date (day/month/year) 22.08.2003	Priority date (day/month/year) 23.08.2002
International Patent Classification (IPC) or national classification and IPC B25B23/14		
Applicant FAST TECHNOLOGY AG et al.		
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 3 sheets, as follows:</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>		
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>		
Date of submission of the demand 18.03.2004	Date of completion of this report 17.12.2004	
Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div> European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 </div> </div>		Authorized Officer Kühn, T Telephone No. +49 89 2399-7883

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP 03/09349

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-13 as originally filed

Claims, Numbers

1-11 received on 03.12.2004 with letter of 02.12.2004

Drawings, Sheets

1/2-2/2 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP 03/09349

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-11
	No: Claims	
Inventive step (IS)	Yes: Claims	1-11
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-11
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. The following international preliminary examination report is based on a clarified wording (cf. interpretation in bold type) of independent claims 1 and 9.

2. **Independent claim 1**

2.1 **Relevant prior art**

DE 196 38 191 A discloses a torque transducer assembly for use in conjunction with a power torque tool comprising:

- a) a housing 9 having an opening therethrough;
- b) a torque transmission shaft 3 extending in said opening and rotatable about an axis extending through said opening,
- c) said shaft having respective end portions 3 accessible from exteriorly of said housing (cf. fig. 1),
- d) a torque transducer element 5 integral with, or carried by said shaft to emanate a magnetic field dependent on the torque in the shaft (cf. col.1, lines 43-49),
- e) a magnetic field sensor arrangement 1,6 located within said housing adjacent said element for sensing the torque-dependent field (cf. col.1, lines 13-23),
- f) said sensor arrangement being operable to provide a torque-dependent signal; and
- g) means (cf. col.1, lines 32-34) for communicating said torque-dependent signal to a signal processing unit externally of the assembly.

2.2 **Differences**

The difference between the subject-matter of claim 1 and **DE 196 38 191 A** is that the torque transducer assembly further comprises a helical spring, whereby a first portion of the helical spring is engaged with the housing of the torque transducer assembly and a second portion is engageable with the housing of a power torque tool to secure the housing of the torque transducer assembly against rotation with respect to said **housing of the power torque tool**.

Since the subject-matter of claim 1 likewise is not known from any other of the available prior art documents, claim 1 fulfils the requirements of Article 33(2) PCT.

2.3 Objective problem

In a torque transducer assembly as known from DE 196 38 191 A with the aforementioned differences, the distinguishing features solve the objective problem of providing a torque transducer assembly which is mountable on a fastening tool.

2.4 Inventive step

The provision of a spring as a coupling means for attaching the adaptor to the fastening tool is not apparent from any of the remaining available prior art documents.

Therefore, claim 1 meets the requirements of Article 33(3) PCT.

2.5 Industrial applicability

Since the torque transducer assembly according to claim 1 can be made and used in industry, claim 1 meets the requirements of Article 33(4) PCT.

3. Independent claim 9

The same reasoning applies mutatis-mutandis to the subject-matter of claim 9, which consequently also meets the requirements of Articles 33(2) to 33(4) PCT.

4. Dependent claims

Dependent claims 2-8 and 10,11 define embodiments of the torque transducer assembly according to claims 1 and 9.

Therefore, they also meet the requirements of Articles 33(2) to 33(4) PCT.

5. Further points

5.1 Although claims 1 and 9 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought. The aforementioned claims therefore lack conciseness and as such do not meet the requirements of Article 6 PCT.

5.2 Lines 10-12 and lines 13-15 on page 3 of claim 9 are identical.

Application No.: PCT/EP2003/009349
Applicant: Fast Technology AG
Our Ref.: 51929 WO

Claims

1. A torque transducer assembly comprising:
 - 5 a housing having an opening therethrough;
a torque transmission shaft extending in said opening and rotatable about an axis extending through said opening, said shaft having respective end portions accessible from exteriorly of said housing,
 - 10 a torque transducer element integral with, or carried by, said shaft to emanate a magnetic field dependent on the torque in the shaft,
a magnetic field sensor arrangement located within said housing adjacent said element for sensing the torque-dependent field, said sensor arrangement being operable to provide a torque-dependent signal; and
 - 15 means for communicating said torque-dependent signal to a signal externally of the assembly;
a helical spring having a first portion engaged with the housing and a second portion engageable with the body of a power torque tool to secure the housing against rotation with respect to said body.
- 20 2. A torque transducer assembly as claimed in Claim 1 in which one end portion of said shaft projects exteriorly of said housing and provides an output portion of the shaft.
3. A torque transducer assembly as claimed in any one of Claims 1 to 2 in which said magnetic field sensor arrangement comprises at least one magnetic field sensor
25 device.
4. A torque transducer assembly as claimed in Claim 3 in which said magnetic field sensor arrangement further comprises a circuit into which the magnetic field sensor device(s) is connected, the circuit and magnetic field sensor device(s) being supported

by said housing, the circuit being operable to output signals representing torque through the means for communicating.

- 5 5. A torque transducer comprising a torque transducer assembly which is as claimed in any one of Claims 1 to 4 and a signal processing unit in communication with said torque transducer assembly for processing said torque-dependent signals, wherein said signal processing unit is operable to process pulse signals representing pulses of torque and is responsive to the amplitude of each pulse signal with reference to the quiescent signal level on which it is imposed.
- 10 6. A torque transducer as claimed in Claim 4 or 5 wherein the means for communication utilizes a wire-less (free of wire connection) form of communication.
- 15 7. A torque transducer comprising a torque transducer assembly which is as claimed in Claim 5 and a signal processing unit connected to said means for communication by an electrical cable, said signal processing unit comprising a circuit into which the magnetic field sensor device(s) is connected through the cable, the circuit being operable to output signals representing sensed torque.
- 20 8. A transducer as claimed in Claim 7 in which signal processing unit is operable to process pulse signals representing pulses of torque and is responsive to the amplitude of each pulse signal with reference to the quiescent level on which it is imposed.
- 25 9. A torque transducer assembly comprising a housing having an opening therethrough, a torque transmission shaft disposed in said housing for rotation about an axis extending through said opening, said shaft having a first portion supported in an annular bush secured to the housing and from which first portion and output portion of the shaft projects,
- 30 - said first portion having a torque transducer element integral therewith, or carried thereby, to emanate a magnetic field dependent on the torque in the shaft, a magnetic

field sensor arrangement embedded in said bush adjacent said element for providing a torque-dependent signal,

said shaft having a second portion distal said output portion and at least partially contained within said opening,

5 said second portion being of larger cross-section than said first portion and abutting said bush,

first means for locating said second portion to rotate with respect to said housing and second means for applying axial force between the housing and said second portion to maintain same in abutment;

10 a helical spring having a first portion engaged with the housing and a second portion engageable with the body of a power torque tool to secure the housing against rotation with respect to said body;

15 a helical spring having a first portion engaged with the housing and a second portion engageable with the body of a power torque tool to secure the housing against rotation with respect to said body.

10. A torque transducer assembly as claimed in Claim 9 in which said first means comprises a bushing located in a circumferential groove around said second portion and engaging an inner surface of said opening.

20

11. A torque transducer as claimed in Claim 10 in which said second means comprises a retainer ring secured in said opening to apply an axial force to said bushing.

⑩ BUNDESREPUBLIK
DEUTSCHLAND



DEUTSCHES
PATENT- UND
MARKENAMT

⑫ Patentschrift
⑮ DE 102 17 416 C 1

⑤ Int. Cl. 7:
G 01 L 5/24
G 01 L 3/00
B 25 B 23/14

⑦ Aktenzeichen: 102 17 416.4-52
⑧ Anmeldetag: 18. 4. 2002
⑨ Offenlegungstag: -
⑥ Veröffentlichungstag
der Patenterteilung: 31. 7. 2003

Innerhalb von 3 Monaten nach Veröffentlichung der Erteilung kann Einspruch erhoben werden

⑦③ Patentinhaber:
Geilenbruegge, Ivo, 40724 Hilden, DE

⑦④ Vertreter:
Ackmann, Menges & Demski Patentanwälte, 40721
Hilden

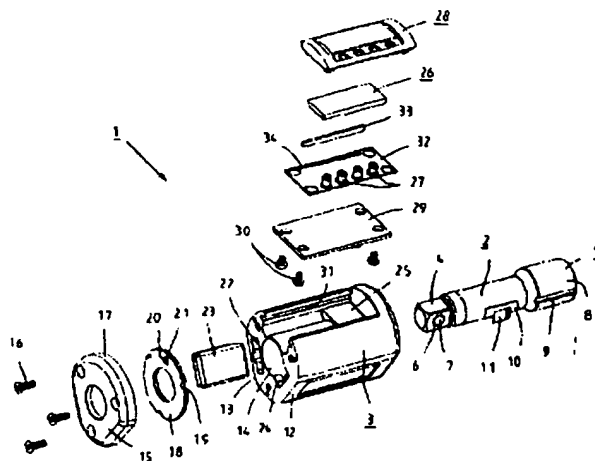
⑦② Erfinder:
gleich Patentinhaber

⑥⑤ Für die Beurteilung der Patentfähigkeit in Betracht
gezogene Druckschriften:

DE 197 08 667 A1
DE 41 04 352 A1
DE 24 29 278 A1
DE 201 20 301 U1

⑤④ Drehmomentmessvorrichtung

⑤⑤ Die Erfindung betrifft eine Drehmomentmessvorrichtung 1, insbesondere zur Verwendung mittels handelsüblicher Werkzeuge, bestehend aus einem Messkopf mit einem zur Drehmomentübertragung vorgesehenen Verbindungselement 2. Aufgabe der vorliegenden Erfindung ist ein universell einsetzbares Drehmomentmessgerät zu schaffen. Erfindungsgemäß ist vorgesehen, dass das Verbindungselement 2 im Messkopf einliegt und einenends mit dem anzuziehenden Bauteil und anderenends mit einem drehmomenterzeugenden Werkzeug unmittelbar verbunden ist, wodurch die Drehmomentmessvorrichtung 1 somit unter Verwendung handelsüblicher Schraubenschlüssel oder anderer elektromotorisch oder pneumatisch angetriebener Werkzeuge eingesetzt werden kann und die Drehmomentmessvorrichtung 1 unmittelbar auf die anzuziehenden Bauteile aufgesetzt wird, während das Werkzeug in einer vorhandenen Werkzeugaufnahme eingesetzt wird. Der besondere Vorteil besteht darin, dass die Drehmomentmessvorrichtung 1 mitrotierend ausgebildet ist und somit die Einsatzmöglichkeit angetriebener Werkzeuge aufgrund der Rotationsmöglichkeit gegeben ist. Ein weiterer Vorteil dieser Ausführung liegt darin, dass das Erreichen des voreingestellten Drehmomentwertes optisch und ggf. akustisch angezeigt werden kann.



DE 102 17 416 C 1

Beschreibung

[0001] Die Erfindung betrifft eine Drehmomentmessvorrichtung, insbesondere zur Verwendung mittels handelsüblicher Werkzeuge.

[0002] Zur Befestigung eines Schraubbolzens oder eines Gewindeteils mit einem bestimmten Drehmoment wird beispielsweise ein Drehmomentschlüssel verwendet, der ein Ablesen des erzielten Anziehmomentes unter Verwendung eines Torsions- oder Biegestabs ermöglicht. Es handelt sich in den meisten Fällen um einen Schlüsselaufsatz, der über einen verlängernden Hebelarm eine manuelle Drehmomentenerzeugung ermöglicht, wobei im einfachsten Fall die Verdrehung eines Torsionsstabs dazu ausgenutzt wird, um über einen Zeiger und eine Ableseskala das Drehmoment zu ermitteln. Hierzu ist in der Regel eine Eichung des Torsionsstabs mit der Skala notwendig. Ein solcher Drehmomentschlüssel wird beispielsweise zum Anziehen der Radmutter eines Fahrzeugs eingesetzt. Die beschriebene Messmethode ist jedoch sehr ungenau und von der richtigen Ableseung des Drehmomentenmesswertes abhängig, weil während des Anziehens das Drehmoment nur äußerst schwierig abzulesen ist. Daneben sind Drehmomentschlüssel mit einem einstellbaren Drehmoment bekannt, wobei mit Erreichen des voreingestellten Wertes eine Unterbrechung der Kraftübertragung erfolgt. Dadurch, dass die Unterbrechung sehr ruckartig und ohne Vorwarnung erfolgt, kommt es hierbei immer wieder zu Verletzungen des Bedieners, weil unerwartet die Mitnahme gelöst wird und damit kein Widerstand vorhanden ist, der dazu führt, dass der Hebelarm herumwirbelt oder der Bediener abrutscht. Aus diesem Grund wird beispielsweise der Schraubbolzen festgeschraubt und mittels eines Drehmomentschlüssels lediglich nur nachgespannt, hierbei kann aber nicht ausgeschlossen werden, dass das Drehmoment bereits überschritten wurde. Des Weiteren wurden Drehmomentenmessgeräte entwickelt, die beispielsweise eine elektrische Messung ermöglichen. Zur Messung der Drehmomente wird die Verformung des Torsionsstabs ausgenutzt und mit Hilfe eines geeigneten Messelements die Verformung in eine Messgröße umgewandelt. Es kann sich beispielsweise um eine Widerstands-, Kapazitäts- oder Induktionsänderung handeln. Bei einem Widerstandselement, beispielsweise einem Dehnungsmessstreifen kann dieses innerhalb einer Wheatstone-Messbrücke eingesetzt werden, sodass mit geringen Widerstandsänderungen ein aussagefähiges Messsignal erzeugt wird. Hierbei handelt es sich vorzugsweise um eine Differenzialmessbrücke zweckmäßiger Weise um eine Wechselstrommessbrücke, die durch die Widerstandsänderung verstümmt wird. Die Dehnungsmessstreifen können hierbei sowohl in einer als auch in zwei Richtungen aktiv sein, sodass eine Steigerung der Eingangsempfindlichkeit möglich ist. Alternativ besteht die Möglichkeit ein kapazitives oder induktives Messelement einzusetzen.

[0003] Moderne Drehmomentmessgeräte nutzen ebenfalls die Torsionsbewegung eines Schaftes aufgrund eines anliegenden Drehmomentes aus, wobei das auftretende Torsionsmoment durch geeignete Messelemente in ein elektrisches Ausgangssignal umgewandelt werden. Ferner kann gleichzeitig der Drehwinkel des Torsionsstabs gemessen werden, sodass die Drehanstiegssteigung mitgemessen wird und genaue Informationen über die Güte der Verbindung vorliegen.

[0004] Die bekannten Drehmomentmessgeräte besitzen aber den Nachteil, dass diese entweder nur nach erfolgter Drehmomentbeaufschlagung zur Nachmessung eingesetzt werden können oder aber die Handhabung des Drehmomentmessgerätes zusammen mit dem drehmomenterzeu-

genden Gerät wesentlich erschwert ist, weil das Drehmomentmessgerät mit dem drehmomenterzeugenden Gerät insoweit gekoppelt sein muss und aufgrund der entstehenden Drehung eine Ablesung erschwert wird oder eine Milderung der Drehmomentenvorrichtung nicht möglich ist. Darüber hinaus zeichnen sich die gängigen Geräte durch großvolumige Gehäuse und einer schlechten Handhabbarkeit aus.

[0005] Aus der Offenlegungsschrift DE 197 08 667 A1 ist beispielsweise ein Verfahren und eine Einrichtung zum Prüfen von Drehmomenten auf Schraubverbindungen, von motorischen Kraftschraubern und von mechanischen Drehmomentschlüsseln, bekannt. Hierbei wird bei einem elektronischen Drehmomentschlüssel ein per Rastung horizontal einstellbarer und fixierbarer axialer Sensorkopf verwendet, sodass dieser Drehmomentschlüssel kraftschlüssig in eine Einrichtung eingelegt ist und neben der Prüfung von Schraubverbindungen auch die Prüfung der genannten Drehmomentwerkzeuge ermöglicht. Die Handhabbarkeit der Einrichtung ist jedoch auf den vorgesehenen Einsatzzweck beschränkt und kann keinesfalls zur ständigen Überwachung während eines Schraubvorganges mit beispielsweise einem drehmoment erzeugenden Werkzeug eingesetzt werden.

[0006] Aus der DE 201 20 301 U1 ist ferner ein Drehmomentschlüssel bekannt, der einen Schaft mit einem Handgriff an einem Ende und einem Werkzeugkopf an seinem anderen Ende aufweist. Eine in den Handgriff integrierte Anzeigeeinheit mit einem verbundenen Messsystem dient zur Drehmomentanzeige, wobei das Messsystem mit der Anzeige hydraulisch gekoppelt ist. Dieser Drehmomentschlüssel ist ausschließlich für den Handbetrieb geeignet und kann ebenfalls nicht für drehmomenterzeugende Werkzeuge eingesetzt werden.

[0007] Aufgabe der vorliegenden Erfindung ist es, ein Drehmomentmessgerät aufzuzeigen, welches universell einsetzbar den heutigen Anforderungen an eine Drehmomentüberwachung gerecht wird und eine zuverlässige und einfache Messaufnahme unter Verwendung handelsüblicher Werkzeuge zur Drehmomenterzeugung ermöglicht.

[0008] Erfindungsgemäß ist zur Lösung der Aufgabe eine Drehmomentmessvorrichtung vorgesehen, die aus folgenden Bestandteilen besteht:

- einem Messkopf mit einem Messkopfgehäuse,
- einem im Messkopf aufgenommenen Verbindungselement zur Drehmomentübertragung,
- welches einenends mit dem anzuziehenden Bauteil und anderenends mit einem drehmomenterzeugenden Werkzeug verbunden ist und
- mindestens einem Messelement auf einer Kontaktfläche, die sich im mittleren Schaftbereich des Verbindungselementes befindet sowie
- einer im Messkopfgehäuse gelagerten Messelektronik, die mit dem Messelement verbunden ist.

[0009] Die erfindungsgemäße Ausführung einer Drehmomentmessvorrichtung betrifft somit ein Gerät, welches aus einem Messkopf und einem Verbindungselement besteht. Die Drehmomentmessvorrichtung kann somit unter Verwendung handelsüblicher Schraubenschlüssel oder anderer Werkzeuge eingesetzt werden, wobei die Drehmomentmessvorrichtung mit den entsprechenden Verbindungselementen unmittelbar auf die anzuziehenden Bauteile aufgesetzt werden kann. Ein besonderer Vorteil ergibt sich durch eine kleine kompakte Bauweise der Drehmomentmessvorrichtung, sodass auch maschinenbetriebene drehmomenterzeugende Werkzeuge, beispielsweise elektrisch oder pneu-

malisch betriebene Werkzeuge, eingesetzt werden können, weil die Drehmomentmessvorrichtung ohne Problem mit rotieren kann. Durch eine kompakte Bauform ist die Drehmomentmessvorrichtung universell einsetzbar und kann auch an schwer zugänglichen Stellen verwendet werden.

[0010] Der Messkopf weist ein Messkopfgehäuse auf, welches drehfest auf dem Verbindungselement gelagert ist und gegebenenfalls über Sicherungsringe axial festgelegt werden kann, wodurch eine Mitdrehung ermöglicht wird und darüber hinaus ein sicherer Halt auf dem Verbindungselement, welches zur Drehmomentübertragung verwendet wird, gegeben ist. Das Verbindungselement kann in einer speziellen Ausführung koaxial im Messkopfgehäuse einlegen und ist hierbei an einer Endseite drehfest mit dem Messkopf bzw. Messkopfgehäuse verbunden, sodass in vorteilhafter Weise keine Verspannung des Messkopfgehäuses bei Torsionsbeanspruchung des Verbindungselementes eintreten kann. Zu diesem Zweck kann das Verbindungselement zur drehfesten Verbindung mit dem Messkopfgehäuse zumindest eine Axialnut aufweisen, in welche zumindest eine Feder des Messkopfgehäuses eingreift. In vorteilhafter Weise werden mehrere Axialnuten und Federn verwendet, die entweder diametral gegenüberliegend oder mehrfach umfangsverteilt angeordnet sind. Das Verbindungselement besteht aus einer Welle die endseitig mit Anschlusselementen, beispielsweise einer Vierkantaufnahme bzw. mit einem Vierkant, versehen ist, die die Verwendung sämtlicher bekannter Werkzeugeinsätze gestattet. Die Axialnut befindet sich vorzugsweise im Bereich der Vierkantaufnahme, welche den größten Außendurchmesser aufweist und somit einerseits einen ausreichenden Querschnitt und andererseits einer nur geringen Torsionsbelastung ausgesetzt ist.

[0011] Das Verbindungselement zwischen den Anschlusselementen weist vorzugsweise im Bereich des Messkopfgehäuses eine plangeschliffene Kontaktfläche für zumindest ein Messelement auf. Das Messkopfgehäuse nimmt die Messelektronik auf und ist im Weiteren mit einem Anzeigedisplay und mehreren Funktionstastern ausgestattet, sodass die zur Programmierung oder Steuerung der Drehmomentmessvorrichtung einzugebenden Daten mit oder ohne Anwenderführung über die Funktionstasten eingegeben werden können. Darüber hinaus kann das Anzeigedisplay zur Anzeige des erzielten Drehmomentmesswertes oder weiterer Daten verwendet werden. Zur Überwachung und Anzeige des eingestellten Drehmomentmesswertes ist in weiterer Ausgestaltung der Erfindung vorgesehen, dass der Messkopf über optische und/oder akustische Signalgeber verfügt. Alternativ besteht die Möglichkeit, dass die Messwerteergebnisse über eine kabellose Sendeeinrichtung einer stationären Funktionseinheit übermittelt werden, welche eine Auswertung der Messergebnisse vornimmt und die ebenfalls über optische und/oder akustische Signalgeber verfügt. Bei dieser Ausführung werden die Funktionstasten optional durch die Funkeinrichtung ersetzt.

[0012] In besonderer Ausgestaltung der Erfindung kann vorgesehen sein, dass die Messelektronik ohne Batterien verwendet wird und die notwendige Versorgungsspannung über einen Transponder eingespeist wird.

[0013] In einer bevorzugten Ausführungsform ist vorgesehen, dass das Messelement zumindest aus einem Dehnungsmessstreifen besteht, der auf der Kontaktfläche aufgeklebt und über geeignete Kontaktelemente mit der in dem Messkopfgehäuse gelagerten Messelektronik verbunden ist. Alternativ besteht die Möglichkeit, dass als Messelement mehrere Dehnungsmessstreifen, ein Piezoelement, ein lineares Hall-Sensorelement, ein keramisches Dehnungselement oder ein elastisches Magnetelement verwendet wird. Die aufgezeigten Messelemente sind sämtliche geeignet auf der

vorhandenen Planfläche des Bindungselementes befestigt zu werden, sodass die auftretende mechanische Torsion in ein elektrisches Signal umgewandelt wird, welches beispielsweise einer bekannten Wheatstonschen-Messbrücke zugeführt wird und eine äußerst genaue Messung nach erfolgter Eichung der Drehmomentmessvorrichtung ermöglicht. Zur Messwertauswertung wird vorzugsweise ein Mikroprozessor eingesetzt, der das von dem Messelement erhaltene Signal über einen Differenzialverstärker und einen A/D-Wandler erhält und somit die Möglichkeit besteht eine Vergleichsmessung über die Funktionstasten mit eingegebenen Werten durchzuführen. Der Mikroprozessor steuert im Weiteren mit vorhandenen Speicherelementen und einer vorhandenen Mikroprogrammierung das Anzeigeelement und überträgt gegebenenfalls die Daten an eine stationäre Funktionseinheit zur weiteren Auswertung und Anzeige der ermittelten Daten.

[0014] Die erfindungsgemäße Drehmomentmessvorrichtung ist für eine Drehmomentmessung, eine Messwertauswertung sowie Überwachung und Übertragung mittels eines eingebauten Microcontroller vorgesehen, wobei die Drehmomentmessvorrichtung mitrotierend ausgebildet ist und sowohl manuell als auch auf maschinenbetriebenen Werkzeugen einsetzbar ist. Durch die Möglichkeit einer Voreinstellung von Grenzwerten durch die Funktionstasten oder ggf. einer externen Kontrolleinheit, können individuelle Messwertbereiche vorgegeben werden, wobei der Anwendbar mit einem optischen und/oder akustischen Signal über das Erreichen des Minimal- und/oder Überschreiten des Maximalwertes rechtzeitig informierbar ist.

[0015] Erfindungsgemäß ist vorgesehen, dass die Drehmomentmessvorrichtung sowohl zur Drehmomentmessung als auch zur Winkelmessung einsetzbar ist. Hiermit besteht die Möglichkeit über die Drehwinkelmessung und Torsionsmessung eine Kennlinie der Schraubverbindung darzustellen und somit detaillierte Kenntnisse über die erzielte Verbindung und deren Güte zu erhalten.

[0016] Der besondere Vorteil der Erfindung liegt darin, dass aufgrund des eingesetzten Verbindungselementes die Drehmomentmessvorrichtung mit allen mechanischen oder kraftbetätigten Werkzeugen eingesetzt werden kann und eine laufende Kontrolle des Drehmomentmesswertes erfolgt und mit Erreichen eines eingestellten Drehmoments ein akustisches und gegebenenfalls optisches Signal erzeugt wird. Ein wesentlicher Vorteil der erfindungsgemäßen Ausführung besteht darin, dass unter Verwendung neuester Mikrochiptechnologie eine äußerst kompakte Bauform geschaffen wird die aufgrund der vorhandenen Anschlusselemente des Verbindungselementes mit nahezu sämtlichen Werkzeugen verwendet werden kann und keinerlei Beeinträchtigungen bei der Schraubverbindungsherstellung mit sich bringt. Das anliegende Drehmoment wird hierbei ständig überwacht und mit Erreichen des voreingestellten Wertes, welcher gegebenenfalls knapp unterhalb dem maximal zulässigen Wert liegen kann, wird ein akustisches Signal der bedienenden Person übermittelt, sodass eine vorzeitige Abschaltung des Werkzeuges möglich ist und eine visuelle Kontrolle des erzielten Messwertegebnisses anhand des Anzeigedisplay nachträglich möglich ist. Für den Fall, dass gleichzeitig eine Winkelmessung erfolgen soll, kann dieses Signal über einen Messwinkelsensor aufgenommen werden und kann über einen Eingangverstärker mit High/Low Filter sowie einem A/D-Wandler dem Mikroprozessor zugeführt werden.

[0017] Die Erfindung wird im Weiteren anhand der Figuren näher erläutert.

[0018] Es zeigt

[0019] Fig. 1 in einer Explorationsdarstellung die erfindungsgemäße Drehmomentmessvorrichtung mit sämtlichen

Einzelteilen.

[0020] Fig. 2 mehrere Ansichten der zusammengebauten Drehmomentmessvorrichtung gemäß Fig. 1 und

[0021] Fig. 3 ein Blockschaltbild der in der Drehmomentmessvorrichtung enthaltenen Elektronik.

[0022] Fig. 1 zeigt in einer Explorationsdarstellung sämtliche Einzelteile einer Drehmomentmessvorrichtung 1, bestehend aus einem zur Drehmomentübertragung vorgesehenen Verbindungselement 2 und einem Messkopfgehäuse 3 sowie den weiteren zur Messung des Drehmoments notwendigen Einzelteilen.

[0023] Das Verbindungselement 2 dient vorrangig zur Übertragung des Drehmoments und unterliegt der Torsionsbelastung, wobei das Verbindungselement 2 aus einem Rundbolzen mit einem einen Ende angeformten Vierkant 4 und einer am gegenüberliegenden Ende angeformten Vierkantaufnahme 5 besteht. Der Vierkant 4 ist zur Aufnahme einer handelsüblichen Schraubbolzenaufnahme, beispielsweise eine Nuss oder dergleichen, vorgesehen und weist zur Halterung und Verriegelung eine in einer Bohrung 6 einliegende Verriegelungskugel 7 auf. Die Vierkantaufnahme 5 ist gegenüber dem Verbindungselement 2 radial vergrößert, sodass eine innenliegende vierkantige Ausnehmung ausgebildet ist, in welche ein drehmomenterzeugendes Werkzeug, beispielsweise ein elektromotorisch oder pneumatisch angetriebenes Gerät mit Vierkant eingesteckt werden kann. Auf der Außenfläche 8 ist in Axialrichtung eine Axialnut 9 ausgebildet, in welche eine korrespondierende Feder des Messkopfgehäuses 3 eingreift, sodass dieses drehfest mit dem Verbindungselement 2 einseitig verbunden ist. Das Messkopfgehäuse 3 kann im Weiteren durch einen axialen Sicherungsring auf dem Verbindungselement 2 gesichert sein, damit dieses nicht von dem Verbindungselement 2 abrutschen kann. Durch die einseitige Befestigung des Messkopfgehäuses 3 auf dem Verbindungselement 2 ist sichergestellt, dass beim Auftreten einer Torsionsbelastung des Verbindungselementes 2 diese Belastung nicht auf das Messkopfgehäuse 3 übertragen wird. Das Verbindungselement 2 weist im mittleren Schaftbereich eine plangeschliffene oder angefasste Kontaktfläche 10 auf, auf der ein Messelement 11, beispielsweise in Form eines Dehnungselements, eines Piezoelements, eines linearen Hall-Sensorelements, eines keramischen Dehnungselements oder eines elastischen Magnetelements, befestigt ist. Das Messelement 11 wird beispielsweise auf die Kontaktfläche 10 aufgeklebt, sodass auftretende Torsionsverformungen des Verbindungselementes 2 auf das Messelement 2 übertragen werden. Die aufgezählten Messelemente 11 setzen die auftretenden Zug- und Druckspannungen in einen Messwert um, der beispielsweise über eine Wheatstone-Messbrücke einer weiteren Elektronik zugeführt werden kann, sodass eine Auswertung des erzielten Drehmoments möglich ist.

[0024] Das Messkopfgehäuse 3 ist im Querschnitt gesehen nahezu rund ausgebildet und mit zwei, in der Umfangsfläche eingearbeiteten Planflächen 12, 13 ausgestattet. Diese Planflächen haben jedoch keine besondere Bedeutung und es kann ebenso ein kreisrundes Messkopfgehäuse 3 oder ein beliebiger anderer Querschnitt gewählt werden. Koaxial in dem Messkopfgehäuse 3 liegt das Verbindungselement 2 nach der Montage in einem Durchbruch 14 ein, in dem die nicht sichtbaren Federn ausgebildet sind, welche in die Axialnut 9 des Verbindungselementes 2 eingreifen. Das Messkopfgehäuse 3 wird nach der Montage durch einen Gehäusedeckel 15 verschlossen, wobei der Gehäusedeckel 15 mittels Schrauben 16 befestigt wird. Der Gehäusedeckel 15 weist auf seiner Innenseite 17 eine axiale Ausnehmung auf, in der eine scheibenförmige Platte 18 nach der Montage einliegt. Im Bereich der Schrauben 16 ist die Platte 18 mit Aus-

nehmungen 19 ausgestattet, sodass die Schrauben 16 in das Messkopfgehäuse 3 eingreifen können. Ferner ist in einer vorhandenen Aussparung 20 ein integrierter Sender 21 eingesetzt, welcher zur Übermittlung der aufgenommenen Messdaten an eine stationäre Auswerteeinrichtung vorgesehen ist. In einer weiteren rechteckförmigen Aussparung 22 des Messkopfgehäuses 3 wird ein flaches Winkelmessselement 23 eingeschoben, welches neben der Torsionsmessung auch den durch die Torsionsverdrrehung erzielten Winkel ermittelt, sodass über die vorhandene Messwertelektronik eine Winkelmessung und Torsionsmessung erfolgen kann und über eine ermittelte Kennlinie detaillierte Kenntnisse über die erzielte Verbindung und deren Güte angezeigt werden können. Der Durchbruch 14 des Messkopfgehäuses 3 ist weitestgehend rund mit einer seitlichen rechteckförmigen Ausnehmung 24, welche korrespondierend zur Kontaktfläche 10 des Verbindungselementes 2 angeordnet ist und genügend Freiraum schafft, sodass eine elektrische Kontaktierung des Messelements 11 mit der weiteren im Messkopfgehäuse 3 angeordneten Messwertelektronik vorgenommen werden kann. Im vorderen Bereich des Messkopfgehäuses 3 ist eine axiale Vertiefung 25 eingelassen, welche zur Aufnahme eines Anzeigedisplays 26 mit Funktionstasten 27 vorgesehen ist. Das Anzeigedisplay 26 ist in einem Gehäuseteil 28 mit einer Bodenplatte 29 aufgenommen, welche über Schrauben 30 verbunden werden können. Die Bodenplatten 29 ist gegenüber dem Gehäuseteil 28 in ihren Abmessungen etwas größer ausgebildet, sodass diese in eine vorhandene Nut 31 des Messkopfgehäuses 3 einschiebbar ist, während das Gehäuseteil 28 in die vorhandene Vertiefung flächenbündig hineingleitet. Das Gehäuseteil 28 wird bevorzugt in einer transparenten Ausführung hergestellt, damit das Anzeigedisplay 26 von außen sichtbar und geschützt ist. Das Anzeigedisplay 26 ist zwischen dem Gehäuseteil 28 und einer Zwischenplatte 32 angeordnet, welche gleichzeitig zur Aufnahme der Funktionstasten 27 verwendet wird. Die genaue Positionierung des Anzeigedisplays 26 wird durch eine Gummileiste 33 gewährleistet, die in einer Nut 34 der Zwischenplatte 32 einliegt. Somit kommt das Anzeigedisplay 26 zwischen der Gummileiste 33 und den Funktionstasten 27 auf der Zwischenplatte 32 zu liegen und wird auf der nach außen weisenden Seite hin durch das Gehäuseteil 28 abgedeckt und zu einer Einheit mittels der Bodenplatte 29 verschraubt. Unterhalb des Gehäuseteils 28 mit der Bodenplatten 29 verbleibt genügend Freiraum um die notwendigen Messwertelektronik aufzunehmen, die mit dem eigentlichen Messelement 11 und ggf. mit dem Winkelmessselement 23 verbunden ist.

[0025] In einer bevorzugten Ausführungsform ist hierbei vorgesehen, dass die ermittelten Messwerte unmittelbar über eine kabellose Funkverbindung einer stationären Auswerteeinheit übertragen werden. Alternativ besteht die Möglichkeit, durch die Messvorrichtung die ermittelten Messwerte auf dem Anzeigedisplay anzuzeigen und über eine akustische oder ggf. optische Anzeige das Erreichen eines voreingestellten Drehmoments zu signalisieren. Die Voreinstellung erfolgt hierbei über die vorhandenen Funktionstasten 27. Alternativ hierzu besteht die Möglichkeit, die Voreinstellung über eine externe Auswerteeinheit vorzunehmen und über die bestehende Funkverbindung die erzielten Messwerte anzuzeigen bzw. auszuwerten und die erforderlichen optischen oder akustischen Signale auszugeben.

[0026] Fig. 2 zeigt in mehreren Seitenansichten und in einer perspektivischen Darstellung die erfindungsgemäße Drehmomentmessvorrichtung 1 nach einem erfolgten Zusammenbau. Das Messkopfgehäuse 3 mit dem Gehäusedeckel 15 ist über Schrauben 16 miteinander verschraubt, wobei das Gehäuseteil 28 mit Anzeigedisplay 26 und Funktionsta-

sten 27 in der vorhandenen Aussparung 25 aufgenommen ist. Ein Vierkant 4 als Welle zur Übertragung des Drehmomentes ragt aus dem Gehäusedeckel 15 heraus und ermöglicht das Anbringen eines handelsüblichen Werkzeugeinsatzes. Am gegenüberliegenden Ende der Welle ist die Vierkantaufnahme ausgebildet, welche jedoch aufgrund der zeichnerischen Darstellung nur aus Fig. 1 ersichtlich ist. In dem Gehäuseteil 28 sind mehrere, wie im gezeigten Ausführungsbeispiel 4, Funktionstasten 27 dargestellt, mit deren Hilfe eine Voreinstellung des zu überwachenden Drehmomentmesswertes sowie eine Anzeigenänderung im Display 26 ermöglicht wird.

[10027] Fig. 3 zeigt in einem Blockschaltbild die wesentlichen Komponenten der Messwertelektronik 50. Diese besteht aus einem Drehmomentsensor mit zumindest einem Messelement 11 und optional aus einem zusätzlichen Winkelmesselement 23, wobei das Ausgangssignal des Messelements 11 über einen Differenzialverstärker einem A/D-Wandler 52 übermittelt und anschließend einer Mikrokontrollereinheit 54 zugeführt wird. Die Mikrokontrollereinheit 54 dient zur Auswertung der erzielten Messsignale, wobei diese einen entsprechenden Speicher für das Programm und die erzielten Messwerte aufweist und mit den Funktionstasten 27 verbunden ist, damit eine Voreinstellung ausgewählt werden kann. Im Weiteren steuert die Mikrokontrollereinheit 54 das Anzeigedisplay 26 an oder übermittelt optional die Daten über eine Sendeeinheit 21 an eine stationäre Auswerteeinheit. Im Fall der Verwendung des Winkelmesselements 23 wird deren Ausgangssignal über einen Verstärker 53 und den A/D-Wandler 52 ebenfalls der Mikrokontrollereinheit zur weiteren Auswertung zugeführt. Mit Hilfe des Drehmomentmesswerts und des Winkelmesswerts kann somit in anschaulicher Weise das winkelabhängig erzielte Drehmoment graphisch, beispielsweise auf dem Anzeigedisplay 26, dargestellt werden. Die gestrichelten Komponenten werden nur optional verwendet.

Bezugszeichenliste

- 1 Drehmomentmessvorrichtung
- 2 Verbindungselement
- 3 Messkopfgehäuse
- 4 Vierkant
- 5 Vierkantaufnahme
- 6 Bohrung
- 7 Verriegelungskugel
- 8 Außenfläche
- 9 Axialnut
- 10 Kontaktfläche
- 11 Messelement
- 12 Planfläche
- 13 Planfläche
- 14 Durchbruch
- 15 Gehäusedeckel
- 16 Schraube
- 17 Innenseite
- 18 Platte
- 19 Ausnehmung
- 20 Aussparung
- 21 Sendeeinheit
- 22 Aussparung
- 23 Winkelmesselement
- 24 Ausnehmung
- 25 Vertiefung
- 26 Anzeigedisplay
- 27 Funktionstaste
- 28 Gehäuseteil
- 29 Bodenplatte

- 30 Schraube
- 31 Nut
- 32 Zwischenplatte
- 33 Gummileiste
- 34 Nut
- 50 Messwertelektronik
- 51 Differenzialverstärker
- 52 A/D Wandler
- 53 Verstärker
- 54 Mikrokontrollereinheit

Patentansprüche

1. Drehmomentmessvorrichtung (1), insbesondere zur Verwendung mittels handelsüblicher Werkzeuge, bestehend aus:
einem Messkopf mit einem Messkopfgehäuse (3),
einem im Messkopf aufgenommenen Verbindungselement (2) zur Drehmomentübertragung,
welches einen mit dem anzuziehenden Bauteil und anderenends mit einem drehmomenterzeugenden Werkzeug verbunden ist und
mindestens einem Messelement (11) auf einer Kontaktfläche (10), die sich im mittleren Schaftbereich des Verbindungselementes (2) befindet sowie
einer im Messkopfgehäuse (3) gelagerten Messelektronik, die mit dem Messelement (11) verbunden ist.
2. Drehmomentmessvorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass das Messkopfgehäuse (3) an einer Endseite drehfest mit dem Verbindungselement (2) verbunden ist.
3. Drehmomentmessvorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass das Messkopfgehäuse (3) über Sicherungsringe axial festgelegt ist und dass das Verbindungselement (2) coaxial im Messkopf einliegt.
4. Drehmomentmessvorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass das Verbindungselement (2) zur drehfesten Verbindung mit dem Messkopfgehäuse (3) zumindest eine Axialnut (9) aufweist, in welche zumindest eine Feder des Messkopfgehäuses (3) eingreift.
5. Drehmomentmessvorrichtung nach einem oder mehreren der Ansprüche 1 bis 4, dadurch gekennzeichnet, dass das Verbindungselement (2) aus einer Welle besteht, welche als Anschlusselemente an einem Ende eine Vierkantaufnahme (5) und am anderen Ende einen Vierkant (4), aufweist, die die Verwendung sämtlicher bekannter Werkzeugeinsätze gestatten.
6. Drehmomentmessvorrichtung nach Anspruch 4 und 5, dadurch gekennzeichnet, dass die Axialnut (9) im Bereich einer Vierkantaufnahme (5) angeordnet ist.
7. Drehmomentmessvorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass die Kontaktfläche (10) plangeschliffen oder angefast ist.
8. Drehmomentmessvorrichtung nach einem oder mehreren der Ansprüche 1 bis 7, dadurch gekennzeichnet, dass das Messkopfgehäuse (3) mit einem Anzeigedisplay (26) und mehreren Funktionstasten (27) ausgestattet ist.
9. Drehmomentmessvorrichtung nach einem oder mehreren der Ansprüche 1 bis 8, dadurch gekennzeichnet, dass der Messkopf über optische und/oder akustische Signalgeber verfügt oder die Messergebnisse über eine kabellose Sendeeinrichtung einer stationären Auswerteeinheit übermittelt, welche eine Auswertung der Messergebnisse vornimmt und über optische und/oder akustische Signalgeber verfügt.

10. Drehmomentmessvorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass das Messelement (11) zumindest aus einem Dehnungsmessstreifen besteht, der auf der Kontaktfläche (10) aufgeklebt und über geeignete Kontaktelemente mit der im Messkopfgehäuse (3) gelagerten Messwertelektronik (50) verbunden ist. 5
11. Drehmomentmessvorrichtung nach einem oder mehreren der Ansprüche 1 bis 10, dadurch gekennzeichnet, dass diese zur Drehmomentmessung und/oder zur Winkelmessung einsetzbar ist. 10
12. Drehmomentmessvorrichtung nach einem oder mehreren der Ansprüche 1 bis 11, dadurch gekennzeichnet, dass als Messelement (11) ein oder mehrere Dehnungsmessstreifen, ein Piezo-Element, ein lineares Hall-Sensorelement, ein keramisches Dehnungselement oder ein elastisches Magnelement einsetzbar ist. 15
13. Drehmomentmessvorrichtung einem oder mehreren der Ansprüche 1 bis 12, dadurch gekennzeichnet, dass die Drehmomentmessung und Messwertauswertung sowie Überwachung und Übertragung mittels eines eingebauten Microcontrollers erfolgen. 20
14. Drehmomentmessvorrichtung nach einem oder mehreren der Ansprüche 1 bis 13, dadurch gekennzeichnet, dass eine Voreinstellung von Grenzwerten durch die Funktionstasten (27) oder eine externe Auswerteeinheit erfolgt und der Anwender mit einem optischen und/oder akustischen Signal über das Erreichen des Minimal- und/oder Überschreiten des Maximalwertes informierbar ist. 25
15. Drehmomentmessvorrichtung nach einem oder mehreren der Ansprüche 1 bis 14, dadurch gekennzeichnet, dass diese rotierbar ausgebildet und sowohl auf manuell als auch auf maschinenbetriebenen Werkzeugen einsetzbar ist. 30

Hierzu 3 Seite(n) Zeichnungen

40

45

50

55

60

65

- Leerseite -

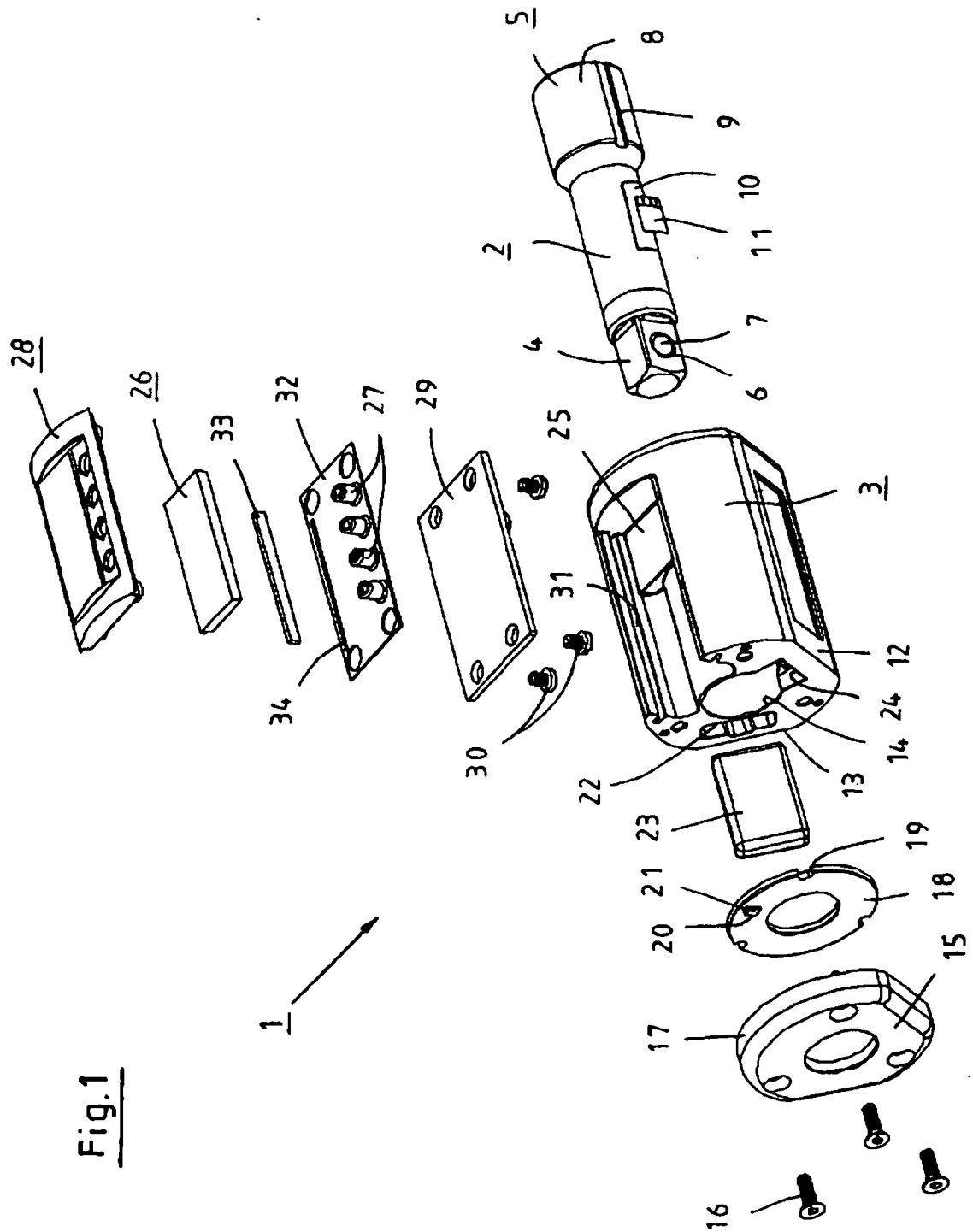
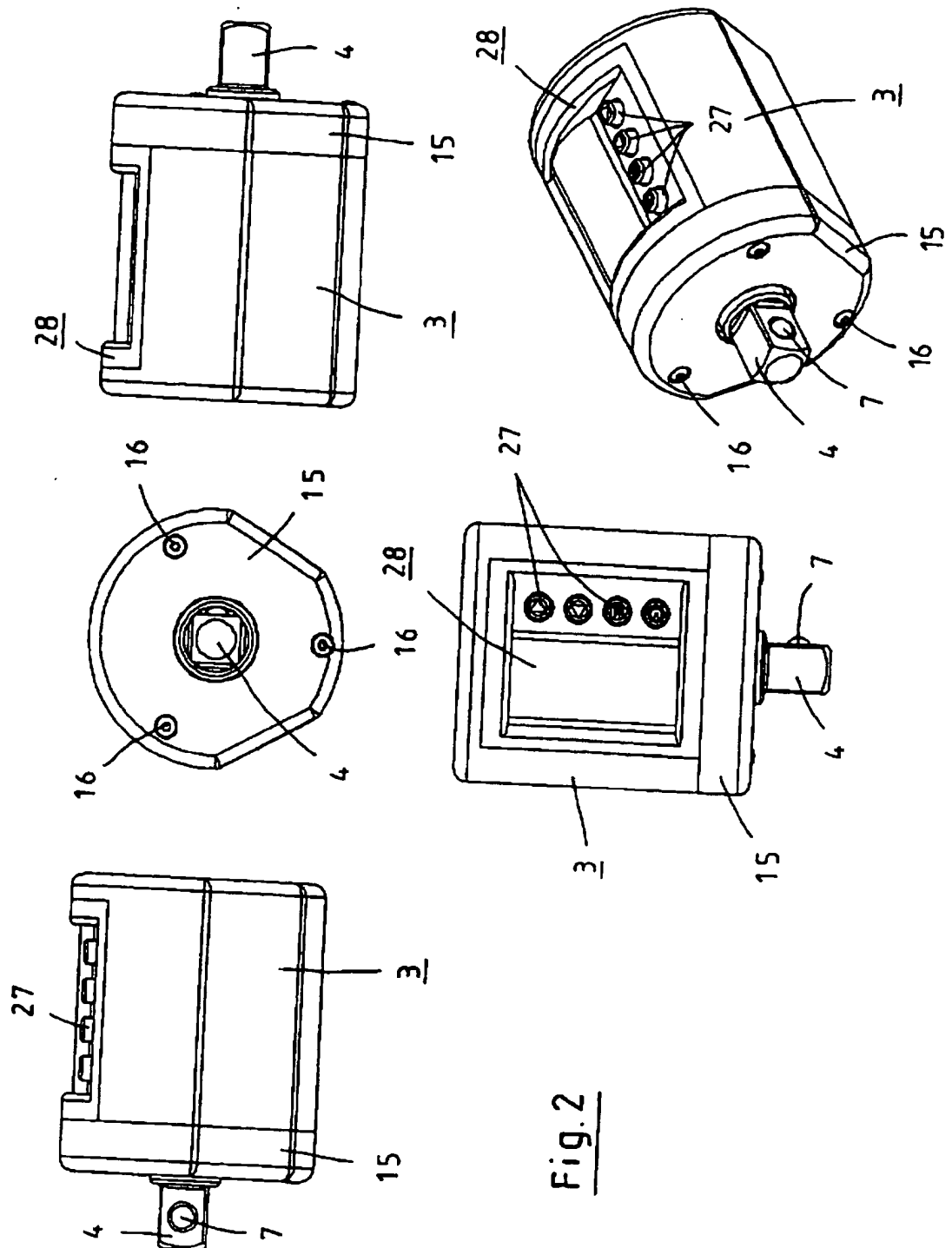


Fig.1



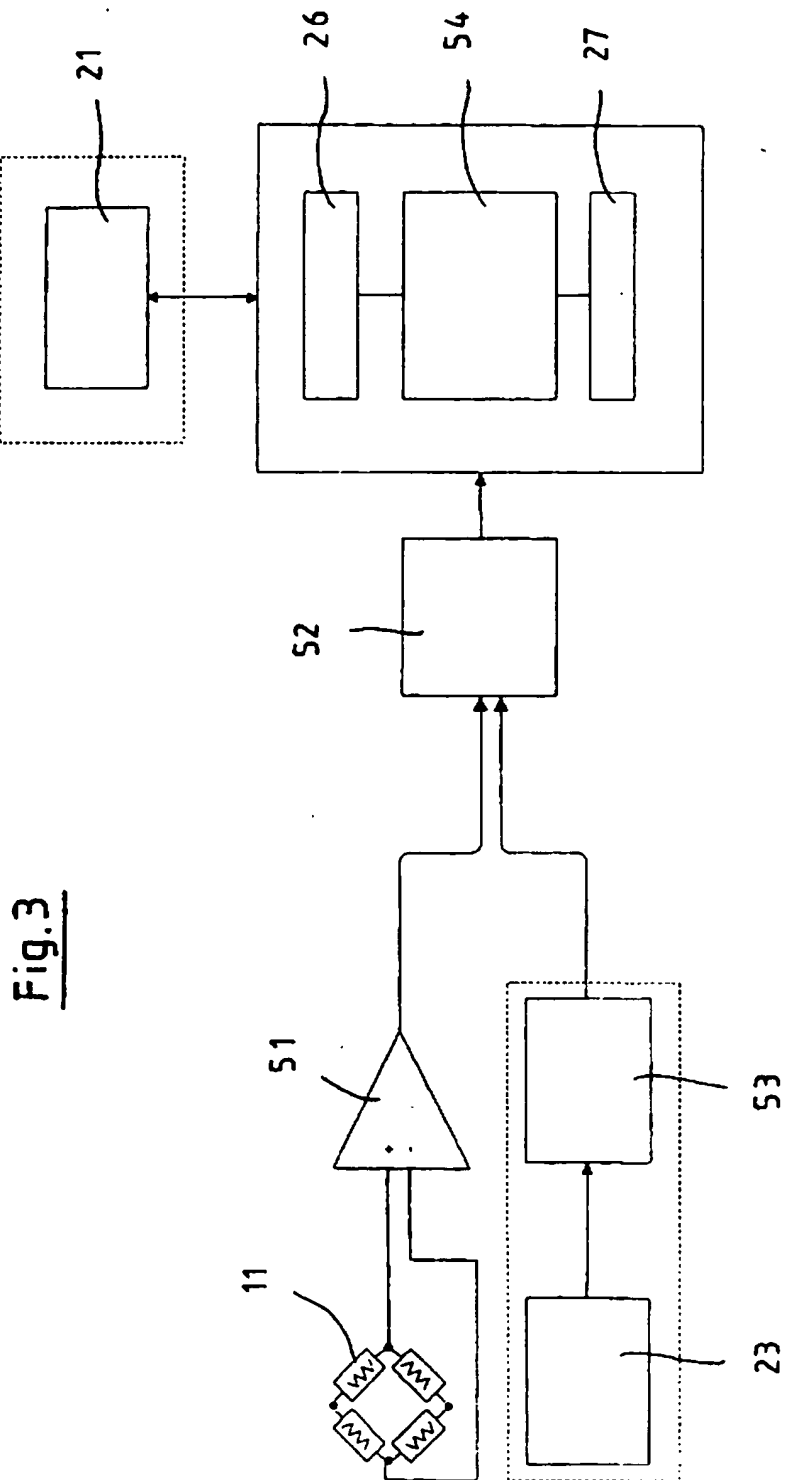


Fig. 3

⑮ BUNDESREPUBLIK
DEUTSCHLAND



DEUTSCHES
PATENTAMT

⑫ **Offenlegungsschrift**
⑩ **DE 196 38 191 A 1**

⑤ Int. Cl.º:
G 01 L 3/04
G 01 L 3/12

⑲ Aktenzeichen: 196 38 191.6
⑳ Anmeldetag: 19. 9. 96
㉑ Offenlegungstag: 26. 3. 98

DE 196 38 191 A 1

⑦① Anmelder:
Kessler, Karl H., 73669 Lichtenwald, DE

⑦② Erfinder:
gleich Anmelder

⑤④ Drehmomentsensor

⑤⑦ Drehmomentsensor für rotierende Momente zum Anschluß an induktive Halbbrücken. Der statisch kalibrierbare Sensor ist frei von stromführenden Installationen auf der rotierenden Welle und besonders auch für ungünstige und stark belastete Einbaubedingungen geeignet.

DE 196 38 191 A 1

Beschreibung

Drehmomentsensoren werden an zahlreichen Stellen im Prüfstandswesen, aber auch in Überwachungssensiblen Aggregaten und Anlagen eingesetzt. Üblich sind Systeme mit elektrischen oder elektronischen Komponenten auf der, mit dem Betriebsdrehmoment belasteten, rotierenden Welle und in dem feststehenden Gehäuse. Neben der Störanfälligkeit ist bei solchen Systemen die besonders in der chemischen Industrie und im Reaktorbau verlangte Explosionssicherheit, ein nicht einfach zu lösendes Problem.

Der nachstehend beschriebene Sensor hat im Gehäuse (9) lediglich 2 einfache und voll vergossene, mit einer niedrigen Wechselspannung betriebene Wicklungen, (1). Die rotierende Welle (3) ist völlig frei von elektrischen Installationen. Das Momentensignal kann mit jeder handelsüblichen, induktiven Meßbrücke mit Halbbrückeneingang, erfaßt werden. Sind keine besonderen Umweltauflagen gegeben, kann die einfache, wenig Raum beanspruchende Elektronik, auch im Gehäuse (9) selbst untergebracht werden. Der Einbau einer Drehzahl oder Winkelmeßeinrichtung ist unproblematisch.

Die Fig. 1 zeigt den Längsschnitt durch den Sensor. Das zu messende Drehmoment wird durch die Welle (3) geleitet, die Wellenstümpfe können je nach Anforderung gestaltet werden. Das Gehäuse (9) kann frei auf der Welle gelagert, es kann aber auch als Steh- oder Flansch-lager konstruiert werden. In Fig. 1 sind für die Gehäuse-lagerung zwei Kugellager verwendet worden.

Im Sensorgehäuse (9) sind die beiden vergossenen Spulen (1) mit ihrem Mantel (6) untergebracht. Die Zuleitungen zu den Spulen (1) können über Stecker oder festen Kabelanschluß erfolgen.

Auf die Welle (3) wird das in Fig. 2 gezeichnete Wandlersystem rotationssymmetrisch und kraftschlüssig montiert. Es hat die Aufgabe, die vom durchgeleiteten Moment bedingte und zwischen den Scheiben (4) und (4a) entstehende Winkelverdrehung, in eine in Achsrichtung verlaufende Längsverschiebung von (5), zu bewerkstelligen. Mit (10) ist der eigentliche Verdrehbereich der Welle (3) bezeichnet.

Der Zylinderförmige, aus magnetisierbaren Material gefertigte Ring (5) verändert bei Momentbelastung durch Verlagerung in Achsrichtung die Luftspalte (2) und (7) zwischen Ring (5) und Spulenmantel (6) und beeinflusst damit den magnetischen Kreis proportional zu dem Moment. Die induktive Halbbrücke wird Moment- und Richtungsabhängig verstimmt.

Die Wandlung des Drehwinkels erfolgt durch die rotationssymmetrisch und gegenläufig angeordneten Stäbe (12). Durch deren Winkel zur Mittelachse kann die Größe der momentabhängigen Längsverschiebung beeinflusst werden.

Um Radialverlagerungen von (5) bei hohen Drehzahlen zu vermeiden, kann dieser durch einen Gleitring oder eine achsialbewegliche Membrane relativ zu (10), abgestützt werden.

Denkbar wäre auch eine fotoelektrische oder kapazitive Abtastung des Ringes (5) relativ zum Gehäuse (9).

Patentansprüche

1. Drehmomentsensor für rotierende Drehmomente mit mechanischem Wandler des momentabhängigen Drehwinkels in eine Längsverschiebung, dadurch gekennzeichnet, daß auf der rotierenden Welle radial und zur Mittelachse unter einem Win-

kel > 0 und $< 90^\circ$ zwei Gruppen gegenläufige Verschiebungsstäbe so angeordnet werden, daß ein in der Mitte zwischen den Stäben angeordneter Ring, in Achsrichtung verschoben wird.

2. Wie 1, dadurch gekennzeichnet, daß der verschiebbare Ring in einem feststehenden induktiven Spulensystem momentabhängige Luftspaltveränderungen bewirkt.

3. Wie 1, dadurch gekennzeichnet, daß für die Abfrage der Lage des verschiebbaren Ringes, ein photoelektrisches System zur Anwendung kommt.

4. Wie 1, dadurch gekennzeichnet, daß die Abfrage der Lage des Ringes durch ein kapazitives System erfolgt.

5. Wie 1, dadurch gekennzeichnet, daß die Abfrage der Lage des Ringes durch magnetfeldabhängige Halbleiter erfolgt.

6. Wie 1 bis 5, dadurch gekennzeichnet, daß der Winkel-Verschiebewandler durch Galvanoplastik hergestellt wird.

7. Wie 1 bis 5, dadurch gekennzeichnet, daß der Winkel-Verschiebewandler durch Erodierung erfolgt.

8. Wie 1 bis 5, dadurch gekennzeichnet, daß die Herstellung nach dem Ätzverfahren erfolgt.

Hierzu 1 Seite(n) Zeichnungen

- Leerseite -

FIG. 1

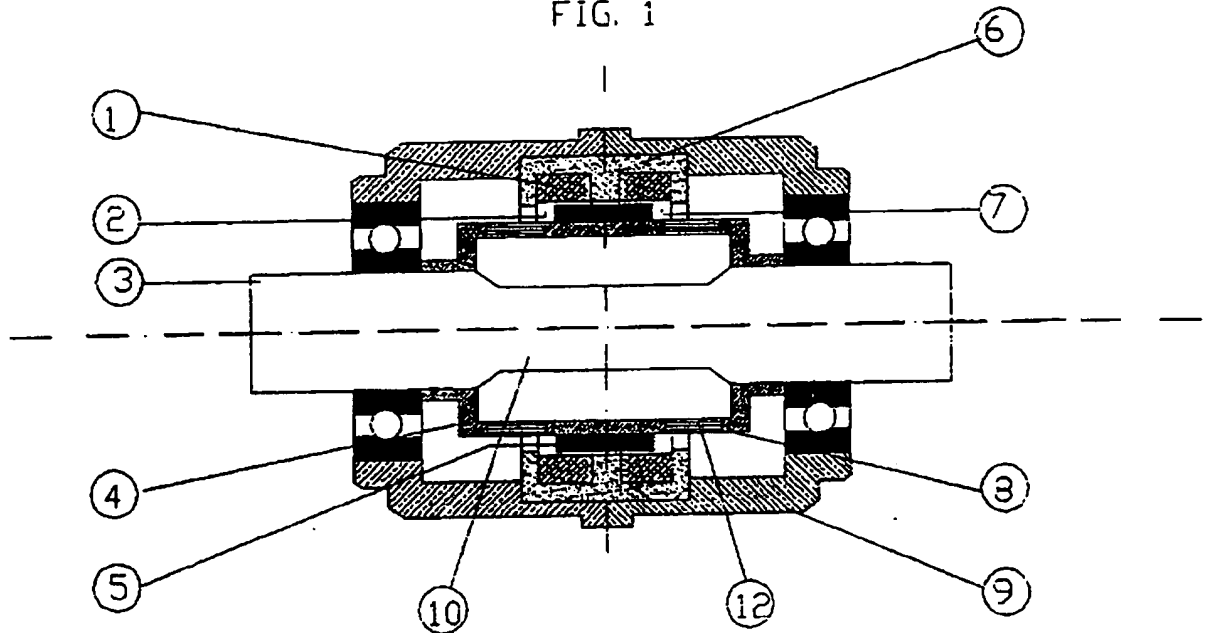
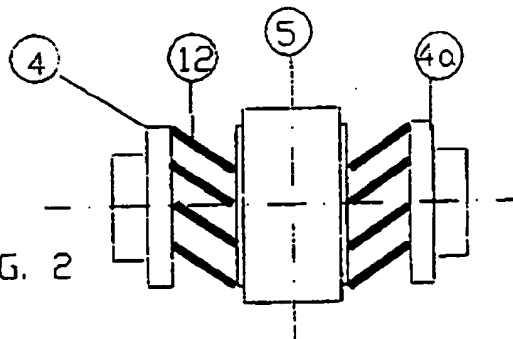


FIG. 2



ANNEX VI

PSP

PETERS, SCHÖNBERGER & PARTNER

BECKER KURIG STRAUSS
 BAVARIASTRASSE 7 · 80336 MÜNCHEN

30. Aug. 2005

RECHTSANWÄLTE WIRTSCHAFTSPRÜFER STEUERBERATER
WV:..

OPERATOR
WV: / LF:

Eilt !!! Bitte sofort vorlegen!

An: Dr. Alexander Straus

Faxnummer: 089/716 303 11

Von: Dr. Axel-Michael Wagner

Seitenzahl inkl. Deckblatt: 2

Bei Rückfragen hilft: Frau Barbara Götz, DW -209

Betreff: ABAS J. May
Ihr Zeichen: 51856 Klage

30. August 2005
93586 / 100832
AWA-dgu

Sehr geehrter Herr Dr. Straus,

Sehr geehrter Herr Dr. Straus,

in der oben genannten Angelegenheit hatte mich Herr May gebeten, auf Ihre Schreiben vom 24.08.2005 zu antworten. Mittlerweile liegt mir auch das Anlagenkonvolut zu diesen beiden Schreiben vor.

26.07.2005 im 3

Schreiben vor.

Zunächst einmal nehme ich zur Kenntnis, dass unser letzter Schriftsatz vom 06.07.2005 im anhängigen Klageverfahren nun in einem ersten Schritt zu einer vertieften Auseinandersetzung der Klagerseite mit den einzelnen Erfindungen und den für die begehrten Unterschriften notwendigen weiteren Dokumente geführt hat. Offensichtlich war man also auch auf der Klagerseite nicht wirklich der Ansicht, ohne die Vorlage weiterer Unterlagen, die es dem Erfinder erlauben, den Wert seiner Erklärung nach US-amerikanischem Recht genau einzuschätzen, eine Abgabe von Blanko-Erklärungen erzwingen zu können.

Was allerdings erstaunt, sind die nun von Ihnen gesetzten außerordentlich knappen Fristen, die sogar knapper ausfallen als die innerhalb der vorgerichtlichen Korrespondenz gesetzten Fristen, obwohl – wie sich nun zeigt – hier ein enormer Aufwand bei der Sichtung der überlassenen Unterlagen notwendig ist. Ein Grund für diese Art der Fristsetzung, nachdem die Angelegenheit nun schon länger gerichtlich anhängig war, ist nicht ersichtlich. Schon angesichts des schier unermesslichen Umfangs der Unterlagen und aufgrund der derzeitigen Arbeitsbelastung trotz Krankheit sieht sich unser Mandant, der Ende letzter Woche aus seinem Urlaub zurückgekehrt und seitdem gesundheitlich stark angeschlagen ist, außerstande, innerhalb der von Ihnen gesetzten Fristen eine Entscheidung darüber zu treffen, ob die von Ihnen nun nochmals begehrten Erklärungen überhaupt anhand der

SCHACKSTRASSE 2 80539 MÜNCHEN TEL.: +49 89 38172-0 FAX: +49 89 38172-204 psp@pspmuc.de www.pspmuc.de

ND. KARI MAJIDHUSOFF
KECHSANYANG
ANJA PETERSHAGEN
WESTON LUTHER SPENCER, 47TH STREET ALBANY
STEFAN NEUENHAIN
PROTSANYANG

KLACHIM DOPFSTADT
WIRTSCHAFTSRECHNER, STEUERBERATER
RALPH-PETER SCHOLZ
WIRTSCHAFTSRECHNER, STEUERBERATER
HEIKE SCHWAB
STEUERBERATERIN

KREUSCHEL & CO, 106 635 300 (BLZ 700 203 00) IBAN D438 7003 0300 0106 6353 00 BIC REUCDE33
 HYPOVEREINSBANK 66 051 099 (BLZ 700 202 70) IBAN D677 7002 0270 0066 0510 99 BIC HYVEDE33
 POBIBANK MÜNCHEN 11 107 804 (BLZ 700 100 80) IBAN D846 7001 0080 0011 1078 04 BIC FBK1DE33

UST.-IDNR.:
DF 130249872

PETERS, SCHÖNBERGER & PARTNER

2

vorliegenden Unterlagen in dieser Form unterzeichnet werden könnten. Dies unabhängig von der Frage, ob unser Mandant angesichts der bereits erhobenen Einreden (keine Inanspruchnahme, Verjährung, Zurückbehaltungsrecht etc.) rechtlich verpflichtet wäre, die Erklärungen, wenn sie denn nunmehr theoretisch abgegeben werden könnten, auch aus rechtlicher Sicht abgeben müsste.

Die Sichtung der – zum Teil auch in chinesischen Schriftzeichen, zum Teil auch in Spanisch - vorliegenden Unterlagen durch unseren Mandanten bzw. die von ihm eingeschalteten Patentanwälte sowie die Einschaltung eines amerikanischen (Patent-) Anwalts, der die Forderung nach Abgabe der Erklärungen vor dem Hintergrund der umfangreichen amerikanischen Anlagen und der in Deutschland streitigen Angelegenheit würdigen kann, wird mindestens einen Monat, möglicherweise auch länger, in Anspruch nehmen, weshalb eine Stellungnahme allerfrühestens Ende September / Anfang Oktober 2005 vorliegen kann. Wir werden nach Sichtung unaufgefordert auf die Angelegenheit zurückkommen.

Nur am Rande weise ich darauf hin, dass anscheinend bei weitem nicht alle vorgelegten Unterlagen im Sinne eines vollständigen Aktenauszuges des USPTO übersandt wurden, sondern zumindest zum Teil eine Vorselektion der Unterlagen stattgefunden hat. Daher besteht das zusätzliche Problem, dass die Unterlagen hier bzw. von den amerikanischen Vertretern unseres Mandanten auf deren Vollständigkeit hin geprüft werden müssen, was bei einer vollständigen Übersendung von Kopien der amtlichen Akten nicht der Fall gewesen wäre.

Mit freundlichen Grüßen


Dr. Axel-Michael Wagner
Rechtsanwalt

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☒ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.